9-6-2020

An Exploratory Data Analysis Study of Open Education Resources in Dental Hygiene Education

Jessica Luebbers

An Exploratory Data Analysis Study of Open Education Resources in Dental Hygiene Education

by

Jessica Luebbers

FACULTY RESEARCH COMMITTEE

Chair: Dane C. Joseph, PhD

Member: Karen Buchanan, EdD

Member: Terry Huffman, PhD

Presented to the Faculty of the

Doctor of Educational Leadership Department

George Fox University

in partial fulfillment for the degree of

DOCTOR OF EDUCATION

September 6, 2020

GEORGE FOX UNIVERSITY

COLLEGE OF EDUCATION | EDD

"AN EXPLORATORY DATA ANALYSIS OF OPEN EDUCATION RESOURCES IN DENTAL HYGIENE EDUCATION," a Doctoral research project prepared by JESSICA LUEBBERS in partial fulfillment of the requirements for the Doctor of Education degree in Educational Leadership.

This dissertation has been approved and accepted by:

Committee Chair

Dane Joseph
Via 4.12.21

March 10, 2021 Dane Joseph, Ph.D. Associate Professor of Education

Karen Buchanan
Via 4.12.21

March 10, 2021 Karen Buchanan, Ed.D. Professor of Education

Terry Huffman
Via 4.12.21

March 10, 2021 Terry Huffman, Ph.D. Professor of Education

Acknowledgements

I have so many I would like to thank for their help and encouragement on my educational journey. First, I would like to offer praise and glory to God for blessing me with such amazing family, friends, and colleagues during this journey. I want to give my most heartfelt thanks and gratitude to my husband Dominic for always supporting me and never letting me give up. He is the strength that held me up on the days where I wanted to walk away and I can never thank him enough for the encouragement and laughs on the bad days. My greatest joy and motivation has been my son Jasper. Jasper, you have been the light that I did not know I was missing and I love you more than I could ever explain. I also want to offer thanks and gratitude to my parents Carl and Sara and my grandma Marjorie. Without your love and encouragement, I likely would not have even considered getting to this level of education.

To my family at George Fox, all I can say is that I am humbled and forever grateful that you invited a science-loving dental hygienist to be one of your colleagues. It has been such a wonderful journey. I will miss my summers spent learning about leadership with my amazing classmates. Thank you to Dr. Susanna Thornhill for believing in me and encouraging me to continue the program after having baby Jasper.

Dr. Dane Joseph, you have been the most wonderful dissertation chair, I could have ever hoped for. You were incredibly supportive and I honestly would not be to this point without your support and encouragement. I always felt empowered after our meetings, and that has meant the world to me. I would also like to offer up my deepest gratitude to my committee members Dr. Terry Huffman and Dr. Karen Buchanan. This was a journey I will never forget and I simply hope I can go forth and do good things with all that I have learned.

Table of Contents

List of Tables

Chapter One

The cost of attending a college or university increases each year. Many institutions of higher education have examined ways to reduce student debt. One potential method to reduce this debt and encourage student retention is through the use of open education resources (OERs) (Couglan, et al, 2013; Islim et al, 2016). “It is well documented in the literature that high-quality OERs can lead to significant financial benefits” (Colvard et al, 2018, p. 263). Also, “previous studies have found that a majority of faculty and students perceive OERs to be equal to, or better than, commercial textbooks in terms of quality” (Colvard et al, 2018, p. 263).

College is increasingly expensive and the cost of educational materials can be a barrier to equitable education opportunities. According to Colvard et al. (2018), students who are burdened with unmet financial needs are more likely to postpone enrollment in higher education, or may decide to not attend college at all. This decision to delay or forgo participation in higher education can have a significant impact on future career and employment opportunities (Colvard et al, 2018; Wiley et al, 2014). Furthermore, some students will choose to attend college, but not purchase textbooks or expensive educational materials; which may negatively impact their ability to learn course material, be successful in classes, and possibly affect their ability to continue learning in their chosen discipline (Colvard et al, 2018).

Wiley et al. (2014) stated that, “at the heart of the open educational resources movement is the simple and powerful idea that the world’s knowledge is a public good and that technology in general and the World Wide Web in particular provide an extraordinary opportunity for everyone to share, use, and reuse that knowledge” (p. 781). Research shows that OERs can support student achievement and retention by making access to learning materials easier, affordable, and more equitable (Colvard et al, 2018; Wiley et al, 2014). Research exists in several areas in higher education regarding the use of OERs, but not necessarily research that is

specific to every discipline (Adams et al, 2013; Hilton, 2016). Currently, there is a general lack of knowledge regarding the use of OERs within dental hygiene (DH) curricula.

Rationale

A study to determine how OERs are utilized within DH curricula could be beneficial in informing the entities who make decisions for the dental hygiene profession and the educators who train those entering the profession. This discipline specific information could assist the American Dental Hygienists' Association (ADHA), the Commission on Dental Accreditation (CODA), the American Dental Educators Association (ADEA), and the educators in making informed decisions, recommendations, and policies for the hundreds of DH programs currently operating in the United States. Therefore, research questions should focus on utilization of OERS and barriers to their use in DH education programs.

Research Questions

The research study will address the following research questions:

1. To what extent are dental hygiene educators in U.S.-based Associates and Bachelor's degree programs using OERs?
2. What barriers prevent dental hygiene educators in U.S.-based Associates and Bachelor's degree programs from using OERs?
3. What are the broad demographics that influence OER adoption and use?
4. To what extent were the responses reliable on the Open Education Resources Readiness Tool Instrument?

Significance

Currently, there is a severe lack of studies, and none known to this author, which address knowledge of any kind related to the use of OERs within dental hygiene programs in the United

States. A study of OERs within the discipline of dental hygiene would address a gap in the knowledge affecting this professional discipline. The significance of this particular study will be to provide baseline descriptive data to organizations and individuals who make policies and important decisions which impact dental hygiene education regarding the use of OERs. Additionally, it would be beneficial to examine the reliability of the instrument responses on the Open Education Readiness Tool. The instrument which is in the form of a questionnaire is new, and has been adapted to fit the needs of researching dental hygiene education. It would be important to know the extent to which the responses are reliable for the purposes of this study, and for future studies in the dental hygiene field which use this instrument. Collectively, this data could bring awareness to the use of OERs and how it might impact student success, as it is known from the literature that OERs improve student achievement outcomes (Colvard et al, 2018; Wiley et al, 2014).

The dental hygiene profession utilizes guidance from numerous organizations, such as ADHA, CODA (the DH accrediting body), and ADEA. These organizations create policies and recommendations regarding dental hygiene education. The organizations and DH educators, could utilize information from an exploratory study about OERs to make informed decisions for the future of dental hygiene education and its role in supporting student retention and success. An example of how the results could be useful is it could promote change in course design by providing educators with examples of how OERs are being implemented. The results could also illustrate whether more training is needed prior to requesting use of OERs. Directors of DH programs might learn about the benefits of OERs and how other institutions are using them, so they gain knowledge that might inform adoption and integration of OERs into pedagogy. Also, results could show there is a need for a database or resource where DH educators could access

discipline specific OERs. Currently, ADEA and CODA have expressed interest about OERs and how they are used in DH education, but no studies currently exist regarding their use. Therefore, at this time the organizations are most interested in determining how they can support educators in using OERs.

Even if the results show that DH programs are successful without the use of OERs, there is already significant data which shows that OERs provide equitable access to course materials, is more cost effective, promotes innovative pedagogy, and that students prefer courses which use OERs. Furthermore, dental hygiene education is moving towards a more digital environment. Digital radiographs, digital charting and billing, and integration with medical software systems for comprehensive care are present in the professional environment of dental hygiene care. Use of OERs could help students become better accustomed to working in this environment earlier in their career through use of technology from the beginning of their education. Also, many institutions of higher education worldwide are requesting utilization of OERs for the purpose of saving students money (McKerlich et al, 2013). Therefore, DH-program specific information could help stakeholders determine appropriate methods to promote integration of OERs, if they are not already used, in order to enhance further student success. Successful students lead to successful healthcare practitioners who care for the health and well-being of the general public.

Limitations and Delimitations

This study will not be without limitations. One possible limitation will be the fact that the survey relies on participants self-reporting their interactions with OERs. Self-reporting on surveys can cause inaccuracies, as the researcher is relying on the participants' knowledge and understanding of the survey questions. If participants guess or answer questions in haste, the accuracy of the results may be affected. Another limitation is related to the fact that this study

will be cross-sectional. The results will reflect information about OERs and dental hygiene education at a certain point in time. The results will not predict implications of OER use over time within dental hygiene education. A delimitation for this study will be the stratification of the sample size. The sample will include DH programs from different geographic locations, but will not include all of the DH programs currently in operation in the United States. This delimitation is intended to include a diverse sample of DH programs, while also increasing the likelihood of a higher response-rate.

Definition of Terms

Open Education Resources: "full courses, course materials, modules, textbooks, streaming videos, tests, software, and any tools, materials, or techniques used to support open access to knowledge" (Tuomi, 2013, p. 61).

Dental Hygiene Education: "Dental hygienists receive their education through academic programs at community colleges, technical colleges, dental schools or universities. The majority of community college programs take at least two years to complete, with graduates receiving associate degrees. Receipt of this degree allows a hygienist to take licensure examinations (national and state or regional), become licensed and to work in a dental office" (ADA, 2020, para. 1). There are universities which offer a bachelor degree in dental hygiene. This additional degree "may be required for a career in teaching and/or research, as well as for clinical practice in school or public health programs" (ADA, 2020).

American Dental Hygienists' Association (ADHA): **"**The American Dental Hygienists' Association (ADHA) is the largest national organization representing the professional interests of the more than 185,000 registered dental hygienists (RDHs) across the country" (American Dental Hygienists' Association [ADHA], 2020, para. 1).

Commission on Dental Accreditation (CODA): "The Commission on Dental Accreditation serves the public and profession by developing and implementing accreditation standards that promote and monitor the continuous quality and improvement of dental education programs" (Commission on Dental Accreditation [CODA], 2020, para. 1).

American Dental Education Association (ADEA): A professional organization for dental educators across the United States and Canada (American Dental Education Association [ADEA], 2020). Their mission is to "lead institutions and individuals in the dental education community to address contemporary issues influencing education, research and the delivery of oral health care for the overall health and safety of the public" (ADEA, 2020, para. 1).

Clinical: "Relating to the observation and treatment of actual patients rather than theoretical or laboratory studies" (Merriam-Webster, 2020, para. 1).

Traditional Teaching Methods: Teaching pedagogy or methodology which utilizes textbooks, hard copy worksheets, and/or lectures to disseminate knowledge from teacher to student (Hilton et al, 2019).

Chapter Two

Literature Review

Open education resources (OERs) are a broad topic which includes an interesting history. Over the past few years, the use of OERs has been dynamic and utilized in a variety of educational settings. This review of the literature will cover a broad history of OERs, how they are used and who uses them, the overall effectiveness of OERs, and a review of dental hygiene education since the founding of the profession. These topics are necessary to review as they demonstrate the value and importance of OERs along with how they are currently being used in education. A broad review of these topics will provide sufficient context and rationale for a study which will utilize exploratory data analysis. Furthermore, a review of the profession of dental hygiene and its educational history will describe the unique background of a highly-specialized profession.

Discussion of Open Education Resources

Education, like many professions, has experienced dynamic changes in recent years. One of these changes includes the introduction and implementation of OERs in courses and programs across various institutions of learning. When examining the literature surrounding OERs, there are several definitions that are utilized to describe what an OER is. Patricia et al, defined OERs as “resources that provide educational content with an open license that facilities their use, adoption, and modification” (2010, p. 122). Tuomi defined OERs as “sources of services” that provide equitable access to knowledge and can be enjoyed by anyone who wishes to access it (2006, p. 1). While some researchers focused on the broad definition of OERs, Wiley (2010) focused on what “open” meant in OERs. Wiley described that to be a true OER, it needs to be free, and that “4 Rs” are also made available to the user of the OER (2010, p. 782). These “4 Rs”

include the ability to freely reuse, revise, remix, and redistribute OER content as needed (Wiley, 2010, p. 782).

Although Wiley (2014) has been studying the idea of OERs since 1996, and is considered to be the subject matter expert on OERs, the term OER was not formally recognized or adopted until the 2002 United Nations Educational, Scientific, and Cultural Organization (UNESCO) forum, which examined the impact of open courseware (UNESCO, 2019). At the forum, the following definition of OERs was created: "the provision of educational resources, enabled by information and communication technologies, for consultation, use, and adoption by a community of users for non-commercial purposes" (Hilton, 2016, p. 24). Tuomi (2013) published a review of Wiley's work on OERs and further describes the definition of OERs to include "full courses, course materials, modules, textbooks, streaming videos, tests software, and any tools, materials, or techniques used to support open access to knowledge" (p. 61).

Use of Open Education Resources

OERs have become increasingly popular in recent years (Tuomi, 2013). There has been rapid growth in online learning and distance education in massive online open courses (MOOCs) and in online programs at traditional universities (Tuomi, 2013). "Open educational resources are now viewed as a natural way to implement distance learning" (Tuomi, 2013, p.59).While there are many different specific definitions of OERs and reasons they are relevant, sources agree they have the potential to be beneficial for institutions of higher education and for students of diverse backgrounds and abilities (Coughlan et al, 2011; Hilton, 2016; Tuomi, 2013; Wiley et al, 2014).

When reviewing the literature on the use of OERs, it is evident that due to the nature of open sources, there are countless ways in which they can be implemented in higher education. Textbooks, software, learning modules, online videos, and even full courses can all be utilized as

an OER (Tuomi, 2013). According to Islim et al, (2016), the use of OERs has morphed into a "movement that aims to eliminate barriers to sharing knowledge for free by making it reachable for everyone" (p. 230). In some instances, educators decide to combine different sources of OERs to customize learning experiences for their students and meet learners' needs (Mathew et al, 2019). In this way, educators can avoid a one-size-fits-all approach to education within their programs or institutions (Mathew et al, 2019; McKerlich, et al, 2013). Use and implementation is only hindered by the availability or willingness to share and lack of imagination on how to use OERs (Hassall et al, 2017; McKerlich et al, 2013).

OERs are used in higher education in diverse ways which include: increase access to course material, mitigate costs of course materials and thereby improve retention, deepen learning on the subject matter, increase critical thinking, and facilitate innovative teaching methodology (Adams, 2013; Feldman-Maggor et al, 2016; Van Acker et al, 2018; Verkuyl et al, 2018; Wiley et al, 2014). Adams (2013) and Wiley et al, (2014) suggest that the use of OERs in some instances is an equity strategy, designed to provide all students with access to course materials from the first day of class, without delay in waiting for hard copies of textbooks. Some chemistry professors use OERs as an innovative teaching technique to deepen learning and expand professional collaboration (Feldman-Maggor, et al, 2016).

In the Netherlands, knowledge sharing and collaboration among professionals was examined as another possible use of OERs in both higher education and early childhood education (Van Acker et al, 2014). The findings of this study indicated that primary schools and higher education institutions use OERs in a myriad of applications with more directed studies needed within each type of educational setting. The authors recommended that the use of OERs be examined within each specific area of education since the results were too varied to be

conclusive (Van Acker et al, 2014). In another instance, educators in a nursing program implemented a project within their curriculum where students worked collaboratively with faculty to create a new OER for nursing education (Verukuyl et al, 2018). Clearly the implementation of OERs can include a variety of forms and reasons for use depending on the educators, the content or discipline area, and the institutions utilizing them.

OERs can be produced in a variety of methods. According to Wiley et al (2014) there are two primary models of producing OERs. These OER production models are called the *institutional production model* and the *commons-based peer production model*. The commons-based peer production model is generally collaborative in nature, where peers work together to create OERs without a manager. This model of OER creation may not utilize subject-matter experts and might raise questions around OER quality. By contrast, the institutional production model usually consists of experts who spend immense amounts of time and resources on the creation of a specific OER by transforming materials used to teach classes into a format that works with OERs.

The institutional production model includes three variations: the integrity model, the essence model, and the remix model (Lane, 2010; Wiley et al, 2014). In the integrity model, the OER is similar to the original content with slight modifications (Wiley et al, 2014). In the essence model, the source material is pared back to only the essential components. The remix model is where source material is used as a framework for OER that is further designed for web delivery. According to Wiley et al, (2014) the institutional production model is generally more expensive as it consumes more time and resources to create. It is perceived to be higher quality due to the resources used to create the OER. In contrast, the peer production model uses less

resources to create and is more collaborative, but is generally perceived as lower quality than the OER created by the institutional model.

Benefits of Open Education Resources

When examining research on OERs, several perceived benefits are evident, namely reduction in cost of course materials, increased student retention, innovative teaching, and an increase in critical thinking and engagement with course materials (Hilton et al, 2019; Wiley et al, 2014). There are differences in how instructors perceived the benefits of OERs versus the students. The following sections will focus on perceived benefits of OERs mainly from the perspective of the instructor.

Cost Reduction. According to the United States Government Accountability Office, "the cost of textbooks in the decade of 2002-12 increased 82%, while overall consumer prices during the same period rose 25%" (Piña & Moran, 2018, p. 1). Furthermore, data from the National Center for Education Statistics reported that if savings on textbooks due to OERs were estimated for only 5% of the 20 million college students in the United States who were enrolled during the Fall of 2011, savings would be approximately one billion dollars per year for students (Mathew et al, 2019). Similarly, Colvard et al, (2018) stated, "it is well documented in the literature that high quality OERs can lead to significant financial benefits for students and/or institutions, as well as reduce the potential of financial debt" (p. 263). The impact of decreasing the cost of courses by moving to OERs and/or reducing the required textbooks could improve both student retention and success, since students would have freely available resources from the beginning of their courses (Hilton, 2016).

Students, as well as educators and institutions, are perceiving the reduction in cost associated with OERS as a benefit (Hilton et al, 2019; Lin, 2019). Mathew et al, (2019)

described how the cost of textbooks is detrimental to students and may cause some to wait on purchasing the textbooks or neglect to purchase them at all. This delay in purchasing textbooks or course materials could cause students to fall behind in their studies, and lead to eventual withdrawal from the course if they are unable to catch up (Hilton et al, 2019).

Furthermore, "a survey of 2,039 students from more than 150 different university campuses showed that up to 65% of students do not buy textbooks due to cost" (Mathew et al, 2019, p. 47; Senack, 2014). This study, conducted by the Student Public Interest Research Group surveyed a random sample of 2,039 college students from random four-year institutions to investigate how textbook prices effect their education (Senack, 2014). Other results of the survey indicated that the high price of textbooks caused some students to take less courses per term or to enroll in courses that did not require as many textbooks (Senack, 2014). According to these researchers, it is evident that cost savings due to OERs can be an important benefit in higher education for both instructors and their students.

Student Success and Retention. Another emerging theme regarding the benefits OERs was the impact on student success and retention. While there were differences regarding the degree to which OERs affect student success, it was generally agreed upon that OERs were not detrimental to student success and could be overwhelmingly positive regarding retention rates (Clinton et al, 2019; Hardin et al, 2019; Hilton et al, 2019; Lin, 2019; Wiley et al, 2014). A study by Hardin et al, (2019) examined the use of an open textbook versus a traditional textbook on student learning outcomes and found no evidence of the OER textbook being detrimental to student learning. Further, there was "evidence of a slight increase in content knowledge when using an OER textbook with improvements from the lowest and highest performing students" (Hardin et al, 2019, p. 48). Students in this study mentioned how the lower cost of the course due

to OER had a significant influence on their choice to enroll in the class and their ability to maintain enrollment (Hardin et al, 2019).

Clinton et al, (2019) also reported similar findings in their meta-analyses study of OERs and learning performance. They examined eleven studies which included data on use of OERs and withdrawal rates. The analysis utilized Hedges g to find the standardized mean differences between the studies. An odds ratio was used to compare withdrawal rates. The odds ratio indicated that withdrawal rates were lower in OER courses. They concluded that the amount of students withdrawing from courses that utilized OERs was lower than those who used traditional textbooks and that OERs could influence retention rates overall (Clinton et al, 2019). These results demonstrate how OERs can contribute to student success and by extension overall student retention in their courses and programs.

Two studies that examined students' perception of success in courses that utilized OERs were Hilton et al (2019) and Lin (2019). The results from both studies demonstrated that students found the OER materials to be more engaging, while also having the benefit of being more affordable. Hilton (2019) stated, "students found value in open pedagogy and believed that open pedagogy had greater overall educational value than traditional educational activities" (p. 275). And Lin (2019) reported that students appreciated the ability to access materials for their course from a variety of settings and technology devices due to the nature of open access. Students from both studies indicated they accessed the course materials more frequently and found the material to be more engaging overall (Hilton et al, 2019; Lin, 2019). During a time when students are more accustomed to accessing and interacting with technology, it is clear that there is a perception from students that engaging with open access course content is desirable and perceived as a better value.

Innovative Teaching Through the Use of Open Education Resources. Another focus of the research surrounding the benefits of OERs is the manner in which they can be used to inspire innovative pedagogy or teaching techniques. Research by Feldman-Maggor et al, (2016) examined the integration of OERs in teaching undergraduate chemistry. They examined the ability to use cognitive learning theory and feedback in courses designed with OERs. According to the authors, feedback is valued as an important component of chemistry courses as it allows the students to see how they are doing in the course and where they can improve. Their focus was to shift some of the learning that occurs in chemistry laboratory settings into a more accessible environment (Feldman-Maggor et al, 2016).

In this instance, the researchers believed that OERS were successful in facilitating good pedagogy in chemistry education, however, they wanted to examine how chemistry instructors were choosing their OERs. They specifically wanted to focus in on how instructors were using quality OERs so that strides might be made to create a database for OERs in their discipline. They were able to determine that all of the participants in their study used OERs. The participants of the study reported that they struggled to both share the OERs and utilize a database to store them for later use. This led the researchers to recommend improvements in access to OER databases for improvements of storing and sharing OERs.

Mathew et al, (2019) examined the use of OERs within an astronomy course and found that the instructors were able to design their course content to be more dynamic and engaging compared to traditional use of textbooks. They illustrated how “resources can be customized to fit the needs of the students and it provides immense flexibility for the instructor to design a course that will serve the need of unique learning communities at various institutions” (p. 48). For their research, they utilized a mixed-method study which examined two sections of the same

course which both had fourteen students enrolled. One section used OERs and the other used traditional textbooks. Both groups of students had the same learning outcomes and assessment methods.

The quantitative results indicated that there was no statistical difference in the final grades between the groups, which indicated that the OER course was not detrimental for student outcomes. The qualitative results illustrated that the students in the OER group reported enthusiasm for the course as they were highly engaged with the material. The group who used the OERs saved money as they had no expenses utilized on a textbook for the course. Mathew et al concluded that "in addition to cost savings, these resources increase the quality of pedagogy and instructional materials and offer instructors innovative ways to engage students and exchange best practices in teaching and learning" (p. 48).

Perhaps the most creative example of innovative use of OERs is one that was developed within a nursing program. Verkuyl et al, (2018) designed a learning experience where students utilized OERs to work collaboratively with instructors to create a new OER for nursing education. The intent of their research was to determine if having students create an OER while simultaneously shifting their focus from being consumers of knowledge to producers of knowledge was beneficial for learning.

In this qualitative study, nursing instructors worked alongside their students to create an open source textbook for nursing students. Students were consulted and included in the entire process. They were asked to think about where they struggled and what worked well when they were learning as novices. Their experiences helped the nursing instructors design the open text with the students while allowing the students to problem solve and suggest creative solutions. When the open source textbook was completed, the students were asked questions about their

experience with creating an OER as part of their own educational experience. The overall conclusion was that students were engaged and accomplished course objectives while creating content for another course in an engaging an innovative manner. Verkuyl et al stated that “OERs can facilitate student-centered pedagogy by creating a medium in which faculty and students work together to create or customize educational materials to meet learning objectives” (p. 75).

Barriers to Open Education Resources

While there are many benefits to using OERs, they also pose some challenges for those who are new to using them. There were varied barriers to the implementation of OERs evident in the literature. Although barriers to OERs affect both students and educators, for the focus of this paper barriers to OERs will focus on ones that impede the educator. Researchers in psychology education described their experience with barriers to OERs as multiple and intertwined ones (Hassall et al, 2017). These include lack of awareness of OERs, lack of motivation for implementation, lack of training, concerns over copyright, and the ability to find and evaluate OERs (Hassall et al, 2017; Islim et al, 2016; Lin, 2019).

Out of a multitude of barriers, there was the most overlap in barriers related to choosing quality OERs and discerning how to evaluate their effectiveness. A study by Islim et al, (2016) examined the use of OERs and found that the most significant barriers noted by the instructors who participated in the study were concerns about other faculty having negative perceptions regarding teaching using OERs, issues with copyright concerns, and an inability to access high quality OERs. A study by Lin (2019) also found similar barriers with instructors reporting concerns about accessing and determining the quality of OERs. Additionally, Lin described how some students also experienced difficulties using OERs due to lack of internet connection (2019).

While many studies and researchers have examined the benefits of OERs, there is one mixed-methods study which focused on the barriers which impact physiology and medical educators when using OERs. Hassall et al, (2017) surveyed 209 physiology and medical educators from a variety of universities about the barriers they experienced when utilizing OERs in their courses. The survey revealed that 68% of the participants consistently used OERs in their courses. Hassall et al, found that though the use of OERs was beneficial for students in clinical practice because of virtual patients and surgery simulators, it caused fatigue and stress for the instructors who taught with the technologies. They found that "educators may have a lack of awareness of tools and technologies and lack the infrastructure or support to implement blended learning techniques into their programs" (p. 77). Similarly, they found that many instructors reported difficulties in finding, modifying, and incorporating OERs into their courses in an effective and timely manner.

The qualitative results indicated that many of the participants in the study knew about additional resources for OERs than were listed as options in the survey, which lead the researchers to determine that lack of knowledge about OERs was not a barrier within this particular sample. The more significant barriers were related to time commitments required to implement OERs, and considerations regarding quality and ability to share content. The results of the study led the researchers to make recommendations which can act as guidelines for the development and selection of quality OERs, which are outlined in the next section.

Barriers to Development and Selection of Open Education Resources. The examination of barriers related to the identification and implementation of OERs led to the creation of specific recommendations by the researchers Hassall and Lewis (2017). Some of the major barriers related to instructor use of OERs is the time needed to find quality OERs and

morph them into appropriate forms while considering copyright laws. Additionally, there were significant barriers in the form of lack of institutional support in providing resources of time and/or monetary support for integrating OERs. Hassall et al, directed their recommendations towards the development and selection of OERs by recommending two actions: "the ongoing curation of a variety of high quality and flexible resources that can be incorporated into specific teaching cases and greater institutional support to provide time and resources to incorporate OERs into the wider pedagogical landscape in an appropriate manner" (p.80).

Many researchers indicate the importance of disciplines initiating their own research to determine the best use of OERs within their own scope of education and practice as a current lack of knowledge in these specific areas could be a barrier to implementation (Adams et al, 2013; Coughlan et al, 2011; Hassall et al, 2017; Lin, 2019; McKerlich et al, 2013; Tuomi, 2013). Adams et al, (2013) researched the use of OERs in higher education. They sought to understand the extent to which OERs are being used in various institutions of higher education. The review of the literature indicated while progress has been made in the creation of OERs, it is still unknown what OER development is occurring that is specific to certain disciplines (Adams et al, 2013). The researchers recommended further questions to be examined, such as, "are there disciplinary differences in the use of OERs?" (Adams et al, 2013, p. 150).

Similarly, another group of researchers supported recommendations to determine how disciplines are utilizing OERs for improvement of interdisciplinary learning (Coughlan et al, 2011). Coughlan et al, found that there is a lack of clarity in OER repositories and there is confusing data as to how different disciplines select and use OERs, which could impede the use of OERs (2011). They believe that in order to promote increased access and involvement with OERS, "institutions need to actively monitor the disciplinary balance within their OER

repositories to ensure that they serve the widest possible audience, especially users seeking resources in disciplines that are under-represented" (Coughlan et al, 2011, p. 23). Hassall et al, (2017) and Lin (2019) also echo these sentiments by posing questions regarding how OERs are used or could be used, especially in specialized disciplines. Similarly, Tuomi (2013) advocates for additional research into the use of OERs in various disciplines to advocate for their use in an attempt to overcome barriers while also supporting teaching in a multi-disciplinary manner.

Wiley et al (2014) described five major challenges to adopting or implementing OERs which include: discovery, sustainability, quality, localization, and remix. Each of these challenges involves complex considerations, but they can be condensed down into core problems. The discovery problem is that OERs can be difficult to find due to the lack specific databases and collections. Even detailed OERs may not be included in a database or collection where instructors can easily find and adopt it. The sustainability problem is due to the fact that open resources are difficult to finance. Institutions might fund small initiatives to promote OERs, but it is more difficult to fund OERs and accessible collections of OERs in a sustainable manner.

Another problem is related to quality of OERs. It can be difficult to determine if an OER is of high quality. There are multiple questions surrounding the notion of how one can even evaluate the quality of an OER and how quality can be defined differently for a diverse range of individuals who might use an OER. Also, it can be challenging to demonstrate that an OER is equal to more traditional resources in terms of quality. A similar problem is one of localization. This is an issue that considers how to make an OER useful to a wide range of users. There are complex factors to consider in that an OER might be extremely useful for one group of users, but out of that local area, it is completely ineffective for another set of users.

Lastly. There is the problem of remixing. Reusing OERs is time consuming and often difficult. Lane et al, (2010) described how remixing an OER can be effective for many instructors, but in remixing, the OER can be rendered useless as it no longer fits the needs of a wider audience. Lane et al, also described how remixing an OER is often a challenge for instructors who are weary of licensing issues and feeling uncertain of how to reuse an OER (2010).

Effectiveness of Open Education Resources

When examining the effectiveness of OERs in the literature, it is clear that it is more difficult to discern than it would seem. Hilton completed a systematic review of 16 studies which examined the effectiveness and perceptions of OERs in higher education settings (2016). Nine of the studies looked exclusively at effectiveness of OERs in terms of improved grades or GPA and decreased withdrawal rates from courses. Studies that examine the effectiveness of OERs attempt to determine how student fare in course outcomes by examining course grades. Many of them failed to consider other confounding variables such as instructor effectiveness and teaching methodology when considering true effectiveness of OERs.

The studies examine by Hilton covered multiple subject areas including statistics, psychology, chemistry, and other general studies courses. Hilton's "results across multiple studies indicate that students generally achieve the same learning outcomes when OERs are utilized and simultaneously save significant amounts of money" (p. 573). While these results are not significantly impactful in terms of student's grades, it does demonstrate the impact OERs have on assisting students by preventing withdrawal from courses due to financial strain. This translates into better retention and likelihood of program completion.

Another study by Venegas-Muggli et al, (2019) examined the effectiveness of OERs in first-year mathematics courses in Chile. This study was mixed method and randomly assigned students into three convenience sample groups: a control group with a traditional text (n=30), an OER group with a licensed open text (n=35), and an OER with a customized open text (n=31). Follow-up qualitative data was collected regarding the perception of the OERs for students and faculty through two semi-structured interviews and a focus group. The quantitative data in the form of test scores and final course grade was analyzed among the three groups.

The quantitative data was analyzed to compare the test results from the OER groups and the control group. The results of the quantitative data indicated that the OER groups had better scores on their examinations than the control group. The results indicated there was no difference between any of the groups as far as final course grades. These results led the researchers to conclude that while OERs, did contribute to student success in the form of higher test scores, it did not cause improvements in course grades between the OER groups and the control group.

Additionally, the results of the qualitative data from interviews and a focus group demonstrated that both the faculty and the students believed the OERs benefitted the course by supporting educational outcomes in an innovative manner. The students also believed that the OERs facilitated the learning process by providing easy access to materials. One interesting result of the study was that while the OER groups had higher test scores, their course attendance was slightly lower than the control group. The researchers believed that this was due to the ease of access with the OERs.

History of Dental Hygiene and Dental Hygiene Education

The dental hygiene profession is a relatively recent profession within the healthcare field. Dental hygienists are considered the prevention specialists in the dental field. They focus on the

prevention of gum disease, dental decay, and other conditions such as oral cancers for their patients (ADA, 2020). Additionally, they are trained in nutrition and how to detect oral signs of nutritional deficiencies. Although dentists have been around in some fashion for centuries, dental hygienists were not officially utilized in dentistry until 1906 (ADHA, 2013).

The first dental hygienist was Irene Newman, who was originally the office assistant of Dr. Alfred Fones who was a dentist in Connecticut. Dr. Fones trained Irene, who was a lay-person, to provide dental prophylaxis or dental cleaning treatments for his patients (ADHA, 2013). Previous to this time, dental treatments were not preventative in nature, but rather treatment oriented, which focused on treating a condition when it caused pain, such as dental decay. Utilizing a dental hygienist, meant that patients could be educated and treated so that dental diseases would not progress to the point of large decay or massive infections.

In 1907 the Connecticut Dental Association amended the law to make it illegal for dentists to train unlicensed assistants or lay-persons to provide treatment in their offices (ADHA, 2013). This meant that any dentist who wanted to employ a dental hygienist, must hire one who had been educated or trained to perform dental hygiene services. Therefore, this amendment initiated a movement to create educational opportunities for individuals who sought training and eventually employment as a dental hygienist.

After years of lobbying, in 1913, a group of dentists gathered funding and earned approval to start the first training program for dental hygienists at the Bridgeport School of Dentistry in Connecticut (ADHA, 2013). Courses were offered at the school through printed lecture books with a follow-up six weeks of hands-on clinical training, for which the students were charged twenty dollars. Thirty-three women, who were originally school teachers, nurses, and the wives of practicing dentists comprised the first class of graduating dental hygienists. In

the following ten years other states added legislation to allow dental hygienists to practice in dental offices and schools under the supervision of a dentist. The training of dental hygienists gained momentum and more individuals sought training in this new profession. “On September 12, 1923, the American Dental Hygienists’ Association was formed, in Cleveland, Ohio” (p. 62).

Roles of the Dental Hygienist

Dental hygienists serve a very important role in healthcare. They are prevention specialists, who focus their efforts on preventing oral diseases from occurring. When a patient has already had gum disease, a dental hygienist can perform specialized procedures which remove disease causing bacteria from around the teeth and gums to prevent further damage to the oral structures and promote healing and health. Gum disease and dental decay can cause extreme pain and suffering to their patients, and dental hygienists help educate their patients on how to prevent these diseases from happening or from getting worse if gum disease is already present.

In all states in the United States, a license and at least two years of training in an associate’s degree program are the minimum requirements for working as a dental hygienist (ADHA, 2020). Dental hygienists must be licensed to practice by each individual state they practice in. Each state required their own licensing requirements which usually consists of proof of clinical examinations along with completion of a state specific ethics examination. This is unique compared to other professions, like nursing, which has portability of their nursing license to different states.

Each state has their own board of dentistry and laws that dictate what services a dental hygienist can perform. A board of dentistry usually consists of several members which include dentists, dental specialists-such as oral surgeons, a dental assistant, a dental hygienist, and a lay

person who has no dental background. In all states, debridement or cleaning of the teeth with instruments and/or ultrasonic power cleaning devices and polishing is allowed with licensure.

Other states that are more progressive in their laws, and allow dental hygienists to give local anesthetics, place dental sealants, and place dental restorations (fillings) with proper training and additional certification (ADA, 2020.) Additionally, the level of supervision required by a dentist varies by state. In some states like Oregon and Washington, dental hygienists can apply for an expanded practice permit after proper training which allows them to practice in schools and other public health settings without working under the direct supervision of a dentist (ADA, 2020). In other states, a dental hygienist must always be supervised and cannot provide treatment to patients if a dentist is not present in the office.

Professional Organizations

Dental Hygienists have the option of belonging to the professional organization of the American Dental Hygienists' Association. The profession currently does not have a union, so the ADHA is an important entity for protecting the standards of the profession and advocating for the more than 185,000 dental hygienists in the United States (ADHA, 2020). The mission of the ADHA is "to advance the art and science of dental hygiene by ensuring access to quality oral health care, increasing awareness of the cost-effective benefits of prevention, promoting the highest standards of dental hygiene education, licensure, practice, and research and representing and promoting the interests of dental hygienists" (para. 2).

The ADHA also has a student chapter which promotes student involvement along with opportunities for networking and scholarships. Furthermore, each state has their own chapter with is comprised of delegates and representatives from regions within each state. These state representatives report back to the ADHA about various issues and concerns within their state.

For example, recently during the COVID-19 pandemic, it was unclear what additional safety precautions should be taken to protect dental hygienists and their patients due to the creation of respiratory droplets and aerosols during dental hygiene procedures. The ADHA worked with representatives from each state and created a task force which researched evidence based methods and procedures to safely return to treating patients. These guidelines were utilized by hygienists across the nation as a framework for what safety precautions and additional personal protective equipment were required to practice during the pandemic.

Dental Hygienists who are also educators have the option of membership in another organization that is focused on dental education, which is the American Dental Education Association (ADEA, 2020). This association serves all dental educators, including: dental, dental hygiene, dental assisting, and dental laboratory technician in the United States and Canada. They proclaim to be the "voice of dental education" (para. 1). Their mission is "to lead institutions and individuals in the dental education community to address contemporary issues influencing education, research and the delivery of oral health care for the overall health and safety of the public" (para. 1).

They focus on research, advocacy, and faculty development in all areas of dental education. ADEA also operates their own journal, the *Journal of Dental Education*. This journal offers peer-reviewed information surrounding issues and topics in dental education. ADEA offers multiple training and education opportunities throughout the year along with support and emphasis on leadership for educators who are new to teaching after leaving careers within the dental industry. ADEA hosts an annual conference which provides networking opportunities, training, seminars, poster presentations, and workshops for members and others interested in dental education.

Professional Standards

The American Dental Hygienists' Association has set forth important professional standards and a code of ethics to guide dental hygiene professionals in their practice of dental hygiene (ADHA, 2020). The standards and code of ethics promotes ethical decision making, providing equal and equitable standards of care to all individuals, using professional skills to benefit the health and well-being of the community in which one practices, and working towards the improvement of access to dental care for all individuals (ADHA, 2020). These standards are in addition to the universal standards in any healthcare profession: do no harm, ensure confidentiality, and to be just, fair and true. Every graduate of an accredited dental hygiene program recites the dental hygiene code of ethics and oath in the presence of their peers and instructors upon program completion.

In addition to the professional standards, dental hygiene educators must also concern themselves with educational standards set forth by the accrediting body, the Commission on Dental Accreditation (CODA, 2020). This commission "serves the public and profession by developing and implementing accreditation standards that promote and monitor the continuous quality and improvement of dental education programs" (para. 1). According to CODA, the standards have been developed for the following reasons: "to protect the public welfare, to serve as a guide for dental hygiene program development, to serve as a stimulus for the improvement of established programs, and to provide criteria for the evaluation of new and established programs" (p. 8).

CODA has established twenty-five standards, many with sub-standards, which need to be followed for the dental hygiene program to earn or maintain their accreditation status (2019). These standards cover a range of subjects from teaching methods, and how patient care is

provided, to what type of patients and experiences need to be provided to students in order for them to reach competence and apply for a license (CODA, 2019). All of these standards must be documented and evidence must be presented to the Commission every seven years in order to maintain accreditation status (CODA, 2019). Failure to provide evidence of following the standards could result in loss of accreditation or a warning, which would require a follow up visit by CODA prior to the seven year cycle.

Progression of Dental Hygiene Education

Dental hygiene has been dynamic since its creation as a profession in the early 1900's. It is a profession driven by science, and evidence-based practice, and therefore, has had to adapt to changes. Dental hygiene education has also had to follow with science and evidence. New technologies and understanding of the oral disease process has been implemented into the curriculum as time went on. In the early years of dental hygiene, it was thought that it was simply the amount of bacteria on the teeth that caused dental disease (Wilkens et al, 2019). Over time, it was discovered that it was not simply the amount of bacteria, but the type of bacteria, and the response of the patient's immune system to the bacteria along with their overall health status that causes the destruction seen in dental diseases (Wilkens et al., 2019). This required a drastic shift in how dental hygiene therapies are provided to patients and how we teach the new generation of dental hygienists.

Over time, dental hygiene education has shifted from teaching students how to use instruments to remove bacteria from the teeth, to how to consider the health and condition of the entire patient in order to prevent and treat dental disease (Wilkins et al, 2019). Over time, it has become clear with evidence that the condition of the entire patient affects the mouth and vice-versa. This requires teaching students how to be detailed in assessing the patient and their overall

health, along with problem solving and collaborating with patients to discover evidence-based solutions which are individualized to each patient.

In order to adapt to this treatment methodology, dental hygiene programs have had to incorporate new technologies into their programs. Ultrasonic scaling devices, local anesthetics, digital radiology, intra-oral cameras, lasers, chemotherapeutics, and salivary diagnostics are just a few of the many technologies which have been incorporated into dental hygiene education in order to help address evidence-based and patient centered therapies. Teaching students a wide variety of technologies is not without challenges. Teaching technology requires technologies. The future of dental hygiene education will always need to be willing to adapt to the newest methods of teaching the latest science and technologies which will be used in clinical practice.

Summary

Dental hygiene education is a dynamic environment that needs to be able to adapt and follow the latest science and technology in order to prepare dental hygienists for current clinical practice with an ability to adapt to changes in science and technology in their future practice. New technologies should be taught in an efficient and effective manner to allow for equitable access by students. Open education resources are an innovative and effective method of allowing students to access relevant knowledge for their chosen discipline in a cost effective manner. They support student success and retention in their programs.

Chapter Three

Methodology

The methodology of this study included a cross-sectional, quantitative questionnaire to determine the extent to which OERs are used in dental hygiene curriculum. The questionnaire included some open-ended questions inquiring about the barriers that may prevent the use of OERs in DH programs. A survey was used instead of an interview because there is no baseline data regarding OER use in DH education. At this time, it is not known what possible issues are surrounding the use of OERS and a survey was the logical place to begin gathering data. Data was gathered using the "Open Educational Resources Readiness Tool", a validated instrument created by McKerlich et al (2013) to determine how faculty in higher education are using OERs. This was the instrument of choice for this particular study as it was created to gather data that is pertinent to the research questions.

This instrument is available for use by other institutions and the researchers who created it encourage its utilization as an open resource (McKerlich et al, 2013). The questionnaire included Likert and ranking-style questions with follow up open-ended questions regarding issues with implementation, adoption, or creation of OERs. Likert and ranking questions also address potential barriers to adoption and implementation of OERs. The data collected from the questionnaires was analyzed using descriptive statistics. Descriptive statistics were utilized because baseline data is needed about the use of OERs in this setting and not enough data exists at this time to form a hypothesis about the extent of use and the barriers to OERs within dental hygiene education. Reliability analyses were also conducted through the use of Cronbach's alpha.

Sampling Plan

The proposed sample size included a regionally stratified sample of 100 out of the 327 DHE programs within the United States (American Dental Hygienists' Association [ADHA], 2017). This sample was utilized as it is representative of programs across the United States and not limited to one geographic area within the country. From each region of the country (NE, NW, SE, and SW), 25 programs were randomly sampled. The expected number of participants was approximately 300, due to accounting for an average of three faculty per program. This sample included a wide range of demographics of educators including diversity in ethnicity, gender, and years of educational experience. This sample was appropriate because it allowed for a wide range of participants while including a manageable sample size.

Procedure and Data Collection

The instrument used for this study included an open resource questionnaire developed by McKerlich et al. (2013). This instrument was utilized without the creator's permission as it is open source. However, this researcher requested permission to modify the survey to make it more applicable to DH educators. The authors of the survey gave this researcher permission to use and modify the instrument. The modified instrument was copied into an online survey platform called Survey Monkey. The contact information for the DH programs was available on the ADHA website, which allowed the author to contact the selected programs for participation. The modified survey was pilot-tested prior to distribution to the entire sample. This was achieved by having a content expert in dental hygiene and an educator in a different discipline complete the survey to check for clarity. The survey was open for four weeks to allow ample time for data collection. When the survey is closed, the data was coded and compiled into an excel spreadsheet for analysis.

Data Analysis

The resulting data was analyzed by using exploratory data analysis techniques, including models and graphs of central tendency and variability. Exploratory data analysis is a set of well-established and highly respected quantitative techniques in their own right. This method of analysis is most useful for those who intend on gathering useful data without allowing a hypothesis or other researcher bias to cloud the analysis or the interpretation of the data relating to the research questions (Tukey, 1977). The research questions with variables about how OERs are used and the barriers that prevent their use, do not have hypotheses linked with them and therefore were analyzed with descriptive statistics. The reliability of the instrument responses were analyzed for internal consistency using Cronbach's alpha. The data was coded and no personal identifying information was utilized.

Table 1

Relationships of Variables- Data Analysis Table

RQ	Dependent Variable	Dependent Variable Measure	Independent Variable	Independent Variable Measure	Analytics
1	Use of OERs	Survey Questions: 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 19, 20, 21, 22, 23	None	None	Exploratory Data Analysis
2	Barriers to using OERs	Survey Questions: 14, 17, 18	None	None	Exploratory Data Analysis
3	Factors which Influence OER Use	Survey Questions: 1, 2, 3, 4, 5	Institution, Gender, Age	Institution, Gender, Age	Correlation
4	Reliability of the Instrument	Internal Consistency Assessments			Cronbach's Alpha

Ethical Considerations

Ethical considerations were addressed by gaining Institutional Review Board (IRB) approval. This was reasonably attainable due to the fact that this is not an experimental study on the participants. The researcher had no conflict of interest to report as the researcher's own institution was not included in the sample. The participants were recruited through the program directors and deans who are members of the American Dental Educators Association and/or the American Dental Hygienists' Association. This contact information is public record from the ADHA (2017). The researcher does not have personal relationships with any of the program directors or deans who assisted with recruiting participants for the study. They were only known to the researcher on a professional level, and none of them are directly working with the researcher. IRB approval was attained before any questionnaires were distributed.

Dissemination of Results

The results of this study will be disseminated to professionals in the dental hygiene and dental education disciplines. This will be accomplished by attempting to publish the results in the *Journal of Dental Education* as well as presenting the results at the American Dental Educators' Association annual conference, which will occur virtually at the end of April 2021. The journal and the professional organization disseminate information to important stakeholders, leaders, policy makers, and educators within the discipline of dentistry. They are important because the leaders in the discipline depend on the journal and the professional organization for information regarding best practices and innovative teaching. The entities who make decisions for accreditation in the dental programs also look to these sources for data to help them create policies and guidelines for schools and health organizations.

Chapter 4

Results

Introduction

The purpose of this study was to determine how OERs are utilized within dental hygiene curricula in different program types across the United States. This study was designed as an exploratory study in order to gain foundational knowledge about current use of OERs and potential barriers which might prevent OER creation, adoption, and use in dental hygiene education. The instrument used for this study was the Open Educational Resources Readiness survey. This survey was slightly modified by the author in order to allow the survey questions to align better with the terminology used in dental hygiene education.

An exploratory data analysis (EDA) study was used in this instance due to the lack of current knowledge regarding use of OERs. The lack of knowledge creates difficulties in forming well-reasoned hypothesis about OER use, and also drove the need for EDA research. While a study examining achievement measures with the use of OERs would be beneficial within dental hygiene programs, it was unknown how many programs were utilizing OERs, or if the educators even know how to use them. Therefore, this EDA study provides the needed foundational knowledge for further investigation into achievement with use of OERs.

This chapter includes information gathered from the Open Education Readiness Tool which was given to the participants via Survey Monkey. The data gathered from Survey Monkey was transferred to SPSS and Excel for descriptive statistical analysis for all 23 questions. Reponses to the surveys were reviewed and themes developed for further discussion in the following sections.

The study's research questions are restated here in order to guide this chapter's narrative.

1. To what extent are dental hygiene educators in U.S.-based Associates and Bachelor's degree programs using OERs?
2. What barriers prevent dental hygiene educators in U.S.-based Associates and Bachelor's degree programs from using OERs?
3. What are the broad demographics that influence OER adoption and use?
4. To what extent were the responses reliable on the Open Education Resources Readiness Tool Instrument?

Reliability of the Open Education Resource Readiness Tool

The fourth research question of this study focused on the reliability of the open education resource readiness tool instrument. The researcher made slight modifications to the wording in the instrument to make it more applicable to dental hygiene educators. The researchers wanted to determine if the OER readiness instrument in its modified form could provide reliable results. In order to determine the reliability of the instrument, the researchers utilized Cronbach's alpha. Cronbach's alpha is a measure of internal consistency and provides information about how closely related a set of items are as a group, or how reliable a scale is. With Cronbach's alpha, a score of 0.9 or greater indicates excellent internal reliability.

When examining the reliability for the survey questions relating to the number of OER types used, the Cronbach's scores were all above 0.9. This reliability data demonstrated there was consistent internal reliability among the participants in the portion of the survey which examined the number of different OER types used. The overall scale reliability for the questions relating to the number of OER types used was a Cronbach's alpha of 0.948.

Table 2

Reliability Data for Number of Open Education Resources Used

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
# open-access OER textbooks used	6.68	17.239	0.925
# open-access supplementary texts used	6.45	17.093	0.919
# open-access 'other' course materials used	6.14	18.668	0.928

The next section of the survey examined the value of various OER materials compared to commercial resources. The reliability data for this section of the survey illustrated the participants were calibrated in answering these questions in this section of the survey. The Cronbach's alpha for this section of the survey was greater than 0.94 for each question in this section. The overall scale reliability for this section had a Cronbach's alpha of 0.951. Therefore, excellent reliability was present.

Table 3

Reliability Data for Value of Open Education Resources

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Value of OER textbooks compared with commercial resources	29.15	66.165	0.947
Value of OER lessons compared with commercial resources	29.18	65.956	0.944
Value of OER software compared with commercial resources	28.93	68.986	0.948
Value of OER games compared with commercial resources	28.82	71.172	0.952
Value of OER scholarly journal access compared with commercial resources	29.22	64.116	0.944

Value of OER quizzes compared with commercial resources	29.04	66.547	0.945
Value of OER audio compared with commercial resources	29.11	64.900	0.942
Value of OER video compared with commercial resources	29.33	64.968	0.946
Value of OER case studies compared with commercial resources	29.27	63.906	0.942
Value of OER tutorials compared with commercial resources	29.10	66.285	0.945

Another section of the survey focused on the cost-reduction of various forms of OERs. The participants demonstrated excellent internal reliability in this section as well. The scale mean, variance, and Cronbach's scores were consistent. The Cronbach's alpha for this section of the survey was 0.94 or greater for each question. The overall scale reliability for the section regarding cost-reduction of OERs was a Cronbach's alpha of 0.953.

Table 4

Reliability Data for Cost-reduction of Open Education Resources

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Cost-reduction of OER textbooks	31.13	49.473	0.947
Cost-reduction of OER lessons	31.10	51.770	0.952
Cost-reduction of OER software	31.00	51.540	0.948
Cost-reduction of OER games	30.88	53.546	0.951
Cost-reduction of OER scholarly journal access	31.16	50.615	0.951
Cost-reduction of OER quizzes	31.02	51.600	0.948
Cost-reduction of OER audio	31.10	49.570	0.945
Cost-reduction of OER video	31.23	48.858	0.947
Cost-reduction of OER case studies	31.20	48.600	0.946
Cost-reduction of OER tutorials	31.09	50.462	0.948

The following section of the survey asked participants about their perception of the ease of use of specific kinds of OERs. The reliability data in this section of the survey also showed good internal reliability similar to the other sections of the survey. The Cronbach's alpha for this

section of the survey was greater than 0.94 for each question. The overall scale reliability for the questions about cost-reduction of OERs was a Cronbach's alpha was 0.952.

Table 5

Reliability Data for Ease of Open Education Resource use

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Ease of OER textbooks	30.17	55.636	0.945
Ease of OER lessons	30.18	56.348	0.946
Ease of OER software	29.99	58.441	0.949
Ease of OER games	29.96	59.273	0.953
Ease of OER scholarly journal access	30.29	54.973	0.948
Ease of OER quizzes	30.13	56.327	0.947
Ease of OER audio	30.18	55.211	0.946
Ease of OER video	30.44	53.699	0.947
Ease of OER case studies	30.34	53.462	0.943
Ease of OER tutorials	30.20	55.419	0.947

The next portion of the survey asked the dental hygiene educators about their likeliness to create different types of OERs. The reliability of the responses was consistent with excellent internal reliability. The data showed the Cronbach's alpha would not significantly change if any one of the questions were removed from the survey. The Cronbach's alpha for this section of the survey was greater than 0.97 for each question. The overall scale reliability for the questions about likeliness to create OERs was a Cronbach's alpha of 0.980.

Table 6

Reliability Data for Likeliness to Create Open Education Resources

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Likeliness to create OER textbooks	29.32	79.749	0.979
Likeliness to create OER lessons	28.67	87.733	0.979
Likeliness to create OER software	29.00	81.725	0.977
Likeliness to create OER games	28.64	88.527	0.980
Likeliness to create OER scholarly journal access	28.90	84.363	0.978
Likeliness to create OER quizzes	28.84	84.172	0.978
Likeliness to create OER audio	29.03	81.009	0.976
Likeliness to create OER video	28.96	81.959	0.977
Likeliness to create OER case studies	29.15	80.243	0.977
Likeliness to create OER tutorials	29.00	81.686	0.976

Another section of the survey asked the dental hygiene educators about factors that influence their use of OERs. The reliability data for this section of the survey indicated excellent internal reliability. If any of the questions were removed from this section of the survey it would not have significantly impacted the reliability scale. The Cronbach's alpha scores for this portion of the survey related to factors of OER use was greater than 0.98 for each question. The overall scale reliability score for this section of questions was a Cronbach's alpha of 0.983.

Table 7

Reliability Data for Influential Factors of Open Education Resource use

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Knowledge Influences OER use	18.56	94.823	0.980
Time to Find, Review, and Select Influences OER use	18.56	94.823	0.980
Academic Quality Influences OER use	18.69	93.208	0.980
Supporting Expertise Influences OER use	18.40	95.292	0.981
Recognition in Efforts Influences OER use	18.22	97.834	0.982
Support from Administration Influences OER use	18.30	96.511	0.981
Hardware/Software to Facilitate Influences OER use	18.50	94.807	0.980
Desire to Reduce Costs to Students Influences OER use	18.56	94.645	0.980
Environmental Concerns Influences OER use	18.25	94.677	0.982

The next section of the survey examined factors which influence the creation of OERs. Consistent with previous sections of the survey, this section also demonstrated excellent internal consistency. Removing any of the questions would not have changed any of the Cronbach's alpha scores significantly. The Cronbach's alpha scores for the section on factors influencing OER creations was 0.98 or greater for each question. The overall scale reliability score for the questions about the factors which influence OER creation was a Cronbach's alpha was 0.989.

Table 8

Reliability Data for Factors Influencing Open Education Resource Creation

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Knowledge Influences OER Creation	18.79	104.819	0.987
Time to Find, Review, and Select Influences OER Creation	18.83	104.457	0.987
Academic Quality Influences OER Creation	18.84	104.589	0.987
Supporting Expertise Influences OER Creation	18.74	105.246	0.987
Recognition in Efforts Influences OER Creation	18.43	109.396	0.989
Support from Administration Influences OER Creation	18.69	105.980	0.987
Hardware/Software to Facilitate Influences OER Creation	18.77	105.048	0.986
Desire to Reduce Costs to Students Influences OER Creation	18.75	105.335	0.987
Environmental Concerns Influences OER Creation	18.54	108.291	0.988

The final section of the survey asked questions related to training interest regarding various aspects of OERs. The reliability data for this section was not quite as high as the previous sections, but it still demonstrated excellent internal reliability. The Cronbach's alpha for this section was 0.96 or greater for each of the questions. The overall scale reliability for the questions about training interest was a Cronbach's alpha of 0.975.

Table 9

Reliability Data for Training Interest in Open Education Resources

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Cronbach's Alpha if Item Deleted
Training Interest in Guidelines to Find OERs	24.88	82.947	0.972
Training Interest in Open Access Textbooks	24.83	84.963	0.975
Training Interest in Authoring Open Access Textbooks	24.74	81.980	0.969
Training Interest in Peer Reviews, Guidelines, and Process for OERs	24.73	82.769	0.970
Training Interest in Copyright/Intellectual Property of OERs	24.74	81.587	0.969
Training Interest in Working in Teams to Create OERs	24.70	81.663	0.973
Training Interest in Promoting Recognition of OER Efforts	24.66	82.325	0.970
Training Interest in how to License OERs	24.69	81.628	0.970

Participants and Socio-Demographics

The third research question of this study concentrated on broad demographics of the dental hygiene educators. The participants in this study were 103 dental hygiene educators from 100 randomly selected dental hygiene programs across the four geographic locations (NW, NE, SW, SE) of the United States. Twenty-five programs from each geographic location were randomly selected in order to capture diverse programs from the population of dental hygiene education institutions. The participants included 39.8% full-time faculty, 45.6% part-time faculty, 12.6% administrators, and 1.9% in multiple roles. Furthermore, 7.8% taught only didactic content and 25.2% taught only in clinical settings. Sixty-seven percent of the sample indicated they taught both clinical and didactic content. The response rate included participation

from 103 educators out of approximately 289 possible respondents. This equated to a response rate of 35.6%.

The study examined the years of experience the educators had within dental hygiene education along with their experience in education beyond the role of a dental hygiene educator. The participant's years of experience in education ranged from 1-20+ years. The majority of the sample (32%) had been in an educational role for 1-5 years. 16.5% had 6-10 years of experience, 17.5% had 11-15 years of experience, 7.8 % had 16-20 years of experience, and 26.2% had 20+ years of experience in teaching. Additionally, some of the educators had experience in instruction outside of the dental hygiene profession. 55.3% had 1-5 years, 9.7 % had 6-10 years, 7.8 % had 11-15 years, 1.9% had 16-20 years, and 10.7% had 20+ years of experience in teaching outside of the profession of dental hygiene. There were also 14.6% of respondents who neglected to answer this question.

Another interesting demographic that was examined for this study was the type of institution and/or program in which these educators worked. The options provided in the survey for institution type and/or program were: bachelor's only, associate's only, community college. University, or multiple categories. Of the 103 participants, 23.3% taught in bachelor's degree programs, 17.5% in associate's degree programs, 10.7% at a community college, 1.9% at a University, and 46.6% reported they worked in multiple categories.

Table 10

Socio-Demographics of Dental Hygiene Educators

Institutional Position		
	Frequency	Percent
Full time faculty	41	39.8
Part time faculty	47	45.6
Administrator	13	12.6
Multiple roles	2	1.9
Total	103	100
Teaching Role		
	Frequency	Percent
Didactic only	8	7.8
Clinical only	26	25.2
Both	69	67.0
Total	103	100.0
Institutional Type and Program Offering		
	Frequency	Percent
Bachelor's only	24	23.3
Associate's only	18	17.5
Community College	11	10.7
University	2	1.9
Multiple Categories	48	46.6
Total	103	100.0
Years of Experience in an Instructional Role as a DHE		
	Frequency	Percent
1-5 years	33	32
6-10 years	17	16.5
11-15 years	18	17.5
16-20 years	8	7.8
20+ years	27	26.2
Total	103	100.0
Years of Experience in an Instructional Role BEYOND DHE Role		
	Frequency	Percent
1-5 years	57	55.3
6-10 years	10	9.7
11-15 years	8	7.8
16-20 years	2	1.9
20+ years	11	10.7
NA or No Answer	15	14.6
Total	103	100.0

Analysis of Open Education Resource Variables

The survey (APPENDDIX A) given to dental hygiene educators included 18 questions inquiring about their understanding, perceptions, experience, and use of OERs. The questions helped determine if the educators are using OERs, how they are using them, and what the perceived value and quality of OERs are compared to traditional purchased commercial resources. Other questions related to OERs also focused on history of creating OERs and interest in training possibilities.

Selection of Open Education Resources

The Dental hygiene educators were asked about the selection process of course resources they use. This included: resources such as textbooks, reading assignments, or multimedia selections. The options for this question regarding selection of course resources were that the instructor selected all the course resources, the department chair or director chose, the selection was shared with another instructor or colleague, or Not applicable or no answer. Forty-eight percent of the educators indicated that they selected all course resources, 21% the department chair or director chose, 30% indicated the selection was shared with another instructor or colleague, and 1% selected not applicable.

Table 11

Selection Method of Open Education Resources

Method of Selecting Course Resources (Ex: textbooks, readings, multimedia selection)		
	Frequency	Percent
I select all the course resources	49	47.6
The department chair or director chooses the course resources	22	21.4
Selection of the course resources is shared with another instructor or colleague	31	30.1
N/A or No answer	1	1.0
Total	103	100.0

Familiarity of Open Education Resources

The survey questions in this section focused on dental hygiene instructors' familiarity with OERs. Educators could choose if they were not at all familiar with OERs, somewhat familiar with OERs, very familiar with OERs, or not applicable or no answer. The results indicated that 62% of DH educators were at least somewhat familiar with OERs. About ten percent of the participants reported being very familiar, while 26% indicated that they were not at all familiar with OERs, and an additional 2% didn't provide an answer. Overall, it appears that approximately 72% of the DH educators had at least some familiarity with OERs.

Table 12

Familiarity with Open Education Resources

OER Familiarity Status		
	Frequency	Percent
Not at all familiar	27	26.2
Somewhat familiar	64	62.1
Very familiar	10	9.7
N/A or No Answer	2	1.9
Total	103	100.0

Current use of Open Education Resources

Participants were asked about their current use of OERs. The examples of OER types was given as a prompt in the question and included: open access textbooks, multimedia, modules and lessons plans. The participants could answer the question with either a "yes" or "no" to indicate if they are using OERs. Forty-six percent of the sample reported that they are using OERs, while 54% indicated they are not.

Table 13

Use of Open Education Resources

OER Course Use Status		
	Frequency	Percent
Yes	47	45.6
No	56	54.4
Total	103	100.0

Origination of Course Open Education Resources

Participants were asked about the origin of the OERs they are using in their courses. The options for the question included: Connections, Open Course Library, College Open Textbooks, use of a search tool, other, or not applicable or unidentifiable. Results regarding OER origination indicated 6% used Connections, 3% used Open Course Library, 6% used College Open Textbooks, and 25% utilized a Search tool. Additionally, 36% of DH educators selected that this question did not apply or they could not identify the source of the OER. The remaining 24% selected “other” to indicate the OERs utilized came from other sources. These “other” sources were listed as materials from other instructors, professional resources available online to all dental professionals, and national board examination practice questions.

Table 14

Origination of Open Education Resources

Origination of OERs (close-ended)		
	Frequency	Percent
Other (please specify)	22	24.1
Connections	7	6.8
Open Course Library	4	3.9
College Open Textbooks	7	6.8
Through a Search Tool	26	25.2
N/A or Unidentified	37	35.9
Total	103	100.0

Quantities of Specific Open Education Resources Used

Lastly, the participants were asked about the number of OER materials used in their classes at textbooks, supplementary materials and other miscellaneous materials. The question options were: none, one or two, three or four, five or more, or all of them. When it came to OER textbooks, 44% reported they used no OERs, 18% use one or two, 4% use three or four, 1% use all OER textbooks, and 33% selected that the question did not apply or them or they did not supply an answer. When asked about the number of supplementary OER materials, 37% report not using any, 20% use one or two, 4% use three or four, 1% use five or more, 2% use all OER supplementary materials, and 36% indicated the question was not applicable or neglected to answer. The DH educators were also asked about the number of "other" types of OERs they use which did not fit into other categories. Twenty-two percent indicated they do not use any other type of OER, 23% use one or two, 10% use three or four, 7% use five or more, 3% use all OERs, and 35% indicated the question did not apply or failed to respond.

The data from the use of OERs among the DH educators who participated indicated that a majority of them, or 54%, are not using OERs. Of those that are using them, they are using a greater number of supplementary or "other" forms of OERs, and not just OER textbooks. The origination of the OERs they are utilizing came from search tools, and other sources instead of established OER databases.

Table 15

Quantities of Open Education Resources used

Number of Open Access OER Textbooks Used		
	Frequency	Percent
None of them	45	43.7
1-2	19	18.4
3-4	4	3.9
All of them	1	1.0
N/A or No Answer	34	33.0
Total	103	100.0
Number of Open Access Supplementary Texts Used		
	Frequency	Percent
None of them	28	36.9
1-2	21	20.4
3-4	4	3.9
5 or more	1	1.0
All of them	2	1.9
N/A or No Answer	37	35.9
Total	103	100.0
Number of Open Access OER "Other" Materials Used		
	Frequency	Percent
None of them	23	22.3
1-2	24	23.3
3-4	10	9.7
5 or more	7	6.8
All of them	3	2.9
N/A or No Answer	36	35.0
Total	103	100.0

Quality of Open Education Resources

The participants were asked questions regarding what they perceived the overall quality of OERs to be. One survey question focused on the quality of specific forms of OERs compared with commercial type resources which have been traditionally used in instruction. The respondents could choose whether they thought OERs were higher in quality, similar in quality, lower in quality, or not applicable. When asked about the quality of OERs compared to purchased resources, 5% felt that OERs were higher quality, 39% similar in quality, 3% lower quality, and 53% selected not applicable or did not give a response. When examining the data from the question about quality, the majority of the educators who responded to the question believe OERs to be of similar or better quality than purchased resources.

Table 16

Quality of Open Education Resources

Quality of Overall OERs Compared with Purchased Resources		
	Frequency	Percent
Higher quality than commercial resources	5	4.9
Similar in quality to commercial resources	40	38.8
Lower quality than commercial resources	3	2.9
N/A or No Answer	54	52.4
Missing Item	1	1.0
Total	103	100.0

Value of Open Education Resources

The questions in this section were focused on the value of OERs in the forms of textbooks, lessons, software, games, scholarly journal access, quizzes, audio, video, case studies, and tutorials when compared to commercial resources that are purchased. It should be noted, that for many responses to these particular questions, there was a large proportion who selected not applicable. These are likely the respondents who were not using OERs, and therefore did not

rank their value. The options for the questions about value were: more valuable, similar in value, less valuable, or not applicable. When asked about the value of OER textbooks compared to commercial resources, 12% selected they were more valuable, 19% similar in value, 6% less valuable, and 63% selected not applicable. In summary, 31% of respondents perceived OER textbooks as being similar or more valuable than traditional textbooks.

The educators also ranked the perceived value of OER lessons. Seven percent ranked them as more valuable, 29% similar value, 5% less valuable, and 59% selected not applicable. The value of OER software was also ranked with 3% selecting more valuable, 22% similar value, 5% less valuable, and 70% chose not applicable. The value of OER games was ranked similarly with 4% selecting more valuable, 15% similar in value, 4% less valuable, and 77% responding with not applicable. The value of open access scholarly journals was ranked as similar or more valuable by 36% of respondents. Fifteen percent perceived OER scholarly journals to be more valuable, 21% similar in value, 1% less valuable, and 63% marked not applicable.

Another area of value explored was OER quizzes. A total of 28% of participants believed that OER quizzes were more valuable or similar in value to commercial type quiz resources. Eight percent believes they were more valuable, 20% similar in value, 5% less valuable, and 67% were not applicable. The next two specific types of OERs examined were audio and video types. Nine percent of participants felt that audio type OERs were more valuable, 24% similar in value, 1% less valuable, and 66% not applicable. Video type OERs were ranked as having more value with 15% ranking video OERs as more valuable, 25% similar in value, 4% less valuable, and 56% as not applicable.

The last two specific types of OERs evaluated for their value compared to commercial resources were case studies and tutorials. When it came to case studies, 13% of respondents indicated more valuable, 25% similar in value, 4% less valuable, and 56% selected not applicable. The value of tutorials was ranked at 8% more valuable, 25% similar in value, 1% less valuable, and 66% not applicable.

When examining the overall responses about the value of specific OERs in this sample of DH educators, there were a few OER types which stood out. The OER scholarly journal access, video, and case studies all had slightly higher percentages in the “more valuable” category. In contrast, fewer educators ranked software and games as being “more valuable” than traditional commercially purchased resources. Another consistent observation in this data set was that approximately 60% of the participants selected the “not applicable” option for ranking the value of each specific type of OER. The responses about the quality of OERs also showed a similar pattern in that the educators who are using OERs perceive them to be equal in quality or better than commercial resources.

Table 17

Value of Open Education Resources

Quality of Overall OERs Compared with Purchased Resources		
	Frequency	Percent
Higher quality than commercial resources	5	4.9
Similar in quality to commercial resources	40	38.8
Lower quality than commercial resources	3	2.9
N/A or No Answer	54	52.4
Missing Item	1	1.0
Total	103	100.0
Value of OER Textbooks Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	12	11.7
Similar in value to commercial resources	20	19.4
Less valuable than commercial resources	6	5.8
N/A or No Answer	65	63.1
Total	103	100.0
Value of OER Lessons Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	7	6.8
Similar in value to commercial resources	30	29.1
Less valuable than commercial resources	5	4.9
N/A or No Answer	61	59.2
Total	103	100.0
Value of OER Software Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	3	2.9
Similar in value to commercial resources	23	22.3
Less valuable than commercial resources	5	4.9
N/A or No Answer	72	69.9
Total	103	100.0
Value of OER Games Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	4	3.9
Similar in value to commercial resources	16	15.5
Less valuable than commercial resources	4	3.9
N/A or No Answer	79	76.7
Total	103	100.0
Value of OER Scholarly Journal Access Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	15	14.6
Similar in value to commercial resources	22	21.4
Less valuable than commercial resources	1	1.0
N/A or No Answer	65	63.1

Total	103	100.0
Value of OER Quizzes Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	8	7.8
Similar in value to commercial resources	21	20.4
Less valuable than commercial resources	5	4.9
N/A or No Answer	69	67.0
Total	103	100.0
Value of OER Audio Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	9	8.7
Similar in value to commercial resources	25	24.3
Less valuable than commercial resources	1	1.0
N/A or No Answer	68	66.0
Total	103	100.0
Value of OER Video Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	15	14.6
Similar in value to commercial resources	26	25.2
Less valuable than commercial resources	4	3.9
N/A or No Answer	58	56.3
Total	103	100.0
Value of OER Case Studies Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	13	12.6
Similar in value to commercial resources	27	26.2
Less valuable than commercial resources	2	1.9
N/A or No Answer	61	59.2
Total	103	100.0
Value of OER Tutorials Compared with Commercial Resources		
	Frequency	Percent
More valuable than commercial resources	8	7.8
Similar in value to commercial resources	26	25.2
Less valuable than commercial resources	1	1.0
N/A or No Answer	68	66.0
Total	103	100.0

Cost Reduction Factors

The next survey questions focused on the perceived cost reduction of specific types of OERs compared to traditional instructional resources. The specific types of OERs that were examined for cost reduction were textbooks, lessons, software, games, scholarly journal access, quizzes, audio, video, case studies, and tutorials. The participants were asked whether they

believed that each specific type of OER greatly reduced costs for students, somewhat reduced costs for students, offers little or no reduction in costs for students, or was not applicable.

The cost reduction of OER textbooks was ranked at 6% selecting greatly reduces cost, 8% somewhat reduces cost, 14% little or no cost reduction, and 68% not applicable. The cost reduction for OER lessons was similar with 7% responding with greatly reduces cost, 10% somewhat reduces cost, 14% little or no cost reduction, and 67% not applicable. OER software cost reduction was ranked with 6% selecting greatly reduces cost, 8% somewhat reduces cost, 14% little or no cost reduction, and 72% not applicable. OER type games cost reduction was perceived by 5% as greatly reduces cost, 2% somewhat reduces cost, 14% little or no cost reduction, and 78% not applicable.

Open access scholarly journals was selected by 10% as greatly reducing costs, 9% somewhat reduces costs, 14% little or no cost reduction, and 78% not applicable. OER quizzes were ranked by 6% as greatly reduces cost, 6% somewhat reduces cost, 19% little or no cost reduction, and 69% not applicable. Audio and video OER resources were also ranked by cost reduction ability. Audio OERs were ranked with 9% of participants selecting greatly reduces cost, 6% somewhat reduces cost, 17% little or no cost reduction, and 68% not applicable. Video OER was ranked as 13% choosing greatly reduces costs, 7% some cost reduction, 19% little or no cost reduction, and 61% not applicable.

The cost reduction impact of case studies was ranked very similarly to that of the videos by participants. Thirteen percent thought OER case studies greatly reduces costs, 4% somewhat reduces costs, 20% little or no cost reduction, and 63% not applicable. OER tutorials were ranked with 9% indicating they greatly reduces cost, 7% some cost reduction, 17% little or no cost reduction, and 6% not applicable.

When examining each type of OER for the perceived cost reduction capabilities, there are some types which are viewed as more cost reducing than others. Textbooks, scholarly journal access, and videos were seen as more cost reducing than the other types of OERs by the educators in this sample. Furthermore, games and tutorials were perceived as having minimal cost reduction ability compared to the others. What was also consistent among the specific types of OERs was that about 60% of the sample selected "not applicable" when ranking the cost reduction ability of the OERs. This was consistent with the responses from the section which evaluated OER value.

Table 18

Cost Reduction Factors Associated with Open Education Resources

Cost-reduction of OER Textbooks		
	Frequency	Percent
Greatly reduces costs for students	11	10.7
Somewhat reduces costs for students	8	7.8
Little or no reduction in costs for students	14	13.6
N/A or No Answer	70	68.0
Total	103	100.0
Cost Reduction of OER Lessons		
	Frequency	Percent
Greatly reduces costs for students	7	6.8
Somewhat reduces costs for students	10	9.7
Little or no reduction in costs for students	17	16.5
N/A or No Answer	69	67.0
Total	103	100.0
Cost-Reduction of OER Software		
	Frequency	Percent
Greatly reduces costs for students	6	5.8
Somewhat reduces costs for students	8	7.8
Little or no reduction in costs for students	15	14.6
N/A or No Answer	74	71.8
Total	103	100.0
Cost-reduction of OER Games		
	Frequency	Percent
Greatly reduces costs for students	5	4.9
Somewhat reduces costs for students	2	1.9
Little or no reduction in costs for students	15	14.6

N/A or No Answer	80	77.6
Missing	1	1.0
Total	103	100.0

Cost-reduction of OER Scholarly Journal Access		
	Frequency	Percent
Greatly reduces costs for students	10	9.7
Somewhat reduces costs for students	9	8.7
Little or no reduction in costs for students	15	14.6
N/A or No Answer	69	67.0
Total	103	100.0

Cost-reduction of OER Quizzes		
	Frequency	Percent
Greatly reduces costs for students	6	5.9
Somewhat reduces costs for students	6	5.9
Little or no reduction in costs for students	19	18.6
N/A or No Answer	71	69.6
Total	102	100.0
Missing	1	

Cost-reduction of OER Audio		
	Frequency	Percent
Greatly reduces costs for students	9	8.7
Somewhat reduces costs for students	6	5.8
Little or no reduction in costs for students	18	17.5
N/A or No Answer	70	68.0
Total	103	100.0

Cost-reduction of OER Video		
	Frequency	Percent
Greatly reduces costs for students	13	12.6
Somewhat reduces costs for students	7	6.8
Little or no reduction in costs for students	20	19.4
N/A or No Answer	63	61.2
Total	103	100.0

Cost-reduction of OER Case Studies		
	Frequency	Percent
Greatly reduces costs for students	13	12.6
Somewhat reduces costs for students	4	3.9
Little or no reduction in costs for students	21	20.4
N/A or No Answer	65	63.1
Total	103	100.0

Cost-reduction of OER Tutorials		
	Frequency	Percent
Greatly reduces costs for students	9	8.7
Somewhat reduces costs for students	7	6.8
Little or no reduction in costs for students	18	17.5
N/A or No Answer	69	67.0
Total	103	100.0

Ease of Use

Another topic of interest in the survey was the ease of use of specific types of OERs compared to traditional resources. The same types of OERs were evaluated as the previous sections which included textbooks, lessons, software, games, scholarly journal access, quizzes, audio, video, case studies, and tutorials. The questions in this section of the survey asked whether each type of OER was “much easier to use than regular materials,” “about the same ease of use,” “more difficult to use than regular materials,” or “not applicable or no answer.”

For OER textbooks, 3% of participants felt that they were much easier to use, 24% same ease of use, 6% more difficult to use, and 67% not applicable. OER lessons were similar in the perceived ease of use with 1% much easier to use, 28% same ease of use, 5% more difficult to use, and 66% not applicable. OER software was ranked with 2% indicating it was much easier to use, 15% same ease of use, 8% more difficult to use, and 75% not applicable.

When it came to the responses for OER games, there was less data ranking its ease of use as 80% of the participants responded with not applicable. Two percent felt that OER games were much easier to use, 17% the same ease of use, and 1% more difficult to use. Scholarly open access journals were perceived by 8% to be much easier to use, 25% same ease of use, 1% more difficult to use, and 66% not applicable. Additionally, OER quizzes were described by 4% as much easier to use, 21% same ease of use, 4% more difficult to use, and 71% not applicable.

Audio and video OERs were the next categories, and they had different levels of perceived ease of use. Audio OERs were ranked by 6% of participants as much easier to use, 22% similar ease of use, 2% more difficult to use, and 70% not applicable. Video OERs were seen as more easy to use than audio ones with 12% responding with much easier to use, 25% same ease of use, 2% more difficult to use, and 59% not applicable.

Lastly, the OER case study and tutorials were examined. The case studies were ranked by 7% of respondents as much easier to use, 29% same ease of use, 1% more difficult to use, and 63% not applicable. The OER tutorials included 6% of participants responding that they were much easier to use, 23% same ease of use, 2% more difficult to use, and 69% not applicable.

Overall, this category about perceived ease of use demonstrated some interesting patterns in the data. The perceived ease of use of games, included a high number of not applicable responses at 80%. This meant that there was only about 19% of participants who were able to rank games as easier or about the same ease of use to traditional education resources. The category of OER software had the highest percentage of responses in the more difficult to use category with 8% of participants indicating that it was more difficult to use than traditional resources.

Additionally, it is worth noting that OER videos were perceived as being much easier to use, with 12% of participants responding in that category. Another OER type that was ranked with a higher percentage for ease of use was scholarly journal access. Eight percent of participants found the scholarly journals to be much easier to use, while only 1% found them to be more difficult. Consistent with the other categories previously mentioned, was the percentage of participants who responded with “not applicable.” Overall, most of the OER types had a 60% or greater response of not applicable.

Table 19

Open Education Resource Ease of Use

Ease of OER Textbooks		
	Frequency	Percent
Much easier to use than regular materials	3	2.9
About the same ease of use	25	24.3
More difficult to use than regular materials	6	5.8
N/A or No Answer	69	67.0
Total	103	100.0
Ease of OER Lessons		
	Frequency	Percent
Much easier to use than regular materials	1	1.0
About the same ease of use	29	28.2
More difficult to use than regular materials	5	4.9
N/A or No Answer	68	66.0
Total	103	100.0
Ease of OER Software		
	Frequency	Percent
Much easier to use than regular materials	2	1.9
About the same ease of use	16	15.5
More difficult to use than regular materials	8	7.8
N/A or No Answer	77	74.8
Total	103	100.0
Ease of OER Games		
	Frequency	Percent
Much easier to use than regular materials	2	1.9
About the same ease of use	18	17.5
More difficult to use than regular materials	1	1.0
N/A or No Answer	82	79.6
Total	103	100.0
Ease of OER Scholarly Journal Access		
	Frequency	Percent
Much easier to use than regular materials	8	7.8
About the same ease of use	26	25.2
More difficult to use than regular materials	1	1.0
N/A or No Answer	68	66.0
Total	103	100.0
Ease of OER Quizzes		
	Frequency	Percent
Much easier to use than regular materials	4	3.9
About the same ease of use	22	21.4
More difficult to use than regular materials	4	3.9
N/A or No Answer	73	70.9
Total	103	100.0

Ease of OER Audio		
	Frequency	Percent
Much easier to use than regular materials	6	5.8
About the same ease of use	23	22.3
More difficult to use than regular materials	2	1.9
N/A or No Answer	72	69.9
Total	103	100.0
Ease of OER Video		
	Frequency	Percent
Much easier to use than regular materials	12	11.7
About the same ease of use	26	25.2
More difficult to use than regular materials	4	3.9
N/A or No Answer	61	59.2
Total	103	100.0
Ease of OER Case Studies		
	Frequency	Percent
Much easier to use than regular materials	7	6.8
About the same ease of use	30	29.1
More difficult to use than regular materials	1	1.0
N/A or No Answer	65	63.1
Total	103	100.0
Ease of OER Tutorials		
	Frequency	Percent
Much easier to use than regular materials	6	5.8
About the same ease of use	24	23.3
More difficult to use than regular materials	2	1.9
N/A or No Answer	71	68.9
Total	103	100.0

Likeliness to Use Open Education Resources

This next section of the survey examined the likeliness that the educators who participated would use OERs. The participants could select whether they were “very likely,” “somewhat likely,” “not at all likely,” or “not applicable or no answer” to use or create specific types of OERs. Twenty-five percent of participants indicated they were very likely to use OERs, 32% were somewhat likely to use them, 7% were not at all likely, and 36% selected not applicable. Cumulatively, that means that 57% of the dental hygiene educators were very likely of somewhat likely to use OERs, while 43% were not at all likely to use OERs or felt the question was not applicable to them.

Table 20

Likeliness to Use Open Education Resources

Likeliness to use OER Materials		
	Frequency	Percent
Very likely	26	25.2
Somewhat likely	33	32.0
Not at all likely	7	6.8
N/A or No Answer	37	35.9
Total	103	100.0

Likeliness to Create Open Education Resources

Another section of the survey included questions which focused on the dental hygiene educators' likeliness to create specific types of OERs. The question asked whether the educators were very likely, somewhat likely, not at all likely, or if the question was not applicable when it came to their likeliness to create OERs. The specific types of OERs which were included in the questions included OER textbooks, lessons, software, games, scholarly journal access, quizzes, audio, video, case studies, and tutorials.

The results for OER textbooks indicated that 4% of the respondents were very likely to create OER textbooks, 9% were somewhat likely, 52% were not at all likely, and 35% not applicable. The next question was about the likeliness to create OER lessons. Twelve percent of educators selected they were very likely to create OER lessons, 26% somewhat likely, 27% not at all likely, and 35% chose not applicable. The responses for the likeliness to create OER software were very similar to the responses for the question on textbooks. Three percent were very likely to create OER software, 8% somewhat likely, 54% not at all likely, and 35% selected not applicable.

When asked about the likeliness to create OER games, 7% chose very likely, 26% somewhat likely, 32% not at all likely, and 35% indicated not applicable. The next question

asked about creation of scholarly journal access. Ten percent of the educators selected very likely to create OER scholarly journal materials, 14% somewhat likely, 41% not at all likely, and 35% not applicable. OER quiz creation was rated by the participants with 14% of them choosing very likely to create, 25% somewhat likely, 26% not at all likely, and 35% not applicable.

The next questions were about audio and video OERs and the likeliness to create them. Twelve percent of participants indicated very likely to create audio OER materials, 22% somewhat likely, 31% not at all likely, and 35% not applicable. Video OER creation was slightly more likely to be created by this sample of educators with 18% responding they were very likely to create, 26 % somewhat likely, 22% not at all likely, and 34% not applicable.

The last two questions in the section about OER creation had similar responses. Case studies included 11% of educators stating they would be very likely to create, 28% somewhat likely, 26% not at all likely, and 35% not applicable. OER tutorials included 13% of respondents selecting very likely to create, 26% somewhat likely, 27% not at all likely, and 34% not applicable.

It is interesting to note that for this section about OER creation, each of the specific categories had 34-35% of participants consistently choosing the “not applicable” option for their likeliness to create each type of OER. Perhaps, this sample of educators had a consistent portion that were unlikely or unwilling to create any type of OER. The data also suggests that there are certain types of OERs that are more or less likely to be created by the sample of the dental hygiene educators. OER textbooks and software were selected as least likely to create with 52% and 54% of educators respectively selecting “not at all likely” to create. The OERs which were more likely to be created by this group of educators were OER video, audio, case, studies, and tutorials.

Table 21

Likeliness to Create Open Education Resources

Likeliness to Create OER Textbooks		
	Frequency	Percent
Very likely	4	3.9
Somewhat likely	9	8.7
Not at all likely	54	52.4
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Lessons		
	Frequency	Percent
Very likely	12	11.7
Somewhat likely	27	26.2
Not at all likely	28	27.2
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Software		
	Frequency	Percent
Very likely	3	2.9
Somewhat likely	8	7.8
Not at all likely	56	54.4
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Games		
	Frequency	Percent
Very likely	7	6.8
Somewhat likely	27	26.2
Not at all likely	33	32.0
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Scholarly Journal Access		
	Frequency	Percent
Very likely	10	9.7
Somewhat likely	15	14.6
Not at all likely	42	40.8
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Quizzes		
	Frequency	Percent
Very likely	14	13.6
Somewhat likely	26	25.2
Not at all likely	27	26.2
N/A or No Answer	36	35.0
Total	103	100.0

Likeliness to Create OER Audio		
	Frequency	Percent
Very likely	12	11.7
Somewhat likely	23	22.3
Not at all likely	32	31.1
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Video		
	Frequency	Percent
Very likely	19	18.4
Somewhat likely	27	26.2
Not at all likely	22	21.4
N/A or No Answer	35	34.0
Total	103	100.0
Likeliness to Create OER Case Studies		
	Frequency	Percent
Very likely	11	10.7
Somewhat likely	29	28.2
Not at all likely	27	26.2
N/A or No Answer	36	35.0
Total	103	100.0
Likeliness to Create OER Tutorials		
	Frequency	Percent
Very likely	13	12.6
Somewhat likely	27	26.2
Not at all likely	28	27.2
N/A or No Answer	35	34.0
Total	103	100.0

Factors which Influence Open Education Resource use

The next section of the survey inquired about particular factors which influence the use of OERs. The possible factors which could influence included: knowledge, time, academic quality of OERs, supporting expertise, recognition in efforts, support from administration, hardware or software, desire to reduce costs for students, and environmental concerns. When answering the questions about OER influential factors, the participants could select “very important,” “somewhat important,” “not at all important,” or “not applicable.”

When asked about knowledge and OER use, 48% of participants selected that it was very important, 18% somewhat important, 2% not at all important, and 32% not applicable. The next

questions asked about the time to find, review, and select OERs and use. Forty-eight percent of the educators indicated that time was a very important factor, 19% somewhat important, and 33% selected not applicable. Academic quality was the next influential factor and 60% said it was very important. Only 7% of participants said academic quality was somewhat important and 33% chose not applicable.

When it came to supporting expertise and use, 42% of the sample selected very important, 15% somewhat important, 10% not at all important, and 33% not applicable. Recognition was the next factor influencing use of OERs and 28% said it was very important, 24% somewhat important, 15% not at all important, and 33% not applicable. Similar results were observed in the support from administration and use category. Thirty-two percent indicated support from administration was very important, 24% somewhat important, 11% not at all important, and 33% not applicable. It is also important to note that one participant neglected to select an answer for this question.

The type of hardware and software and its influence on OER use was the next question in this section. Forty-four percent of the educators indicated the technology in the form of hardware or software was very important, 20% somewhat important, 4% not at all important, and 32% not applicable. Another question asked the educators about their desire to reduce costs to students and its influence on use of OERs. Forty-eight percent of the sample selected very important, 18% somewhat important, 2% not at all important, and 32% not applicable. Lastly, the educators were asked about environmental concerns or desire to conserve paper and its influence on OER use. Twenty-one percent selected very important, 26% somewhat important, 12% not at all important, and 33% not applicable.

When examining the data for the section about inferential factors for OER use, some interesting patterns appear. As noted before, there seems to be a consistent percentage of the sample who selects not applicable in this section. The questions about influential factors had a consistent response of 32-33% of the sample choosing the “not applicable” option. Another intriguing finding was that the factors of time and academic quality both had the highest percentages of “very important” responses and zero participants who selected “not at all important.” The data from this section suggests that time to find, review, and select OERs, academic quality, and the desire to reduce students costs are the most important influential factors for OERs in this sample. The least important influential factors affecting OERs as indicated by this sample were recognition for implementing OERs and environmental concerns.

Table 22

Factors which Influence Open Education Resource use

Knowledge Influences OER Use		
	Frequency	Percent
Very important	49	47.6
Somewhat important	19	18.4
Not at all important	2	1.9
N/A or No Answer	33	32.0
Total	103	100.0
Time to Find, Review, and Select OERs Influences Use		
	Frequency	Percent
Very important	49	47.6
Somewhat important	20	19.4
N/A or No Answer	34	33.0
Total	103	100.0
Academic Quality of Materials Influences OER Use		
	Frequency	Percent
Very important	62	60.2
Somewhat important	7	6.8
N/A or No Answer	34	33.0
Total	103	100.0
Supporting Expertise Influences OER Use		
	Frequency	Percent
Very important	43	41.7
Somewhat important	16	15.5
Not at all important	10	9.7
N/A or No Answer	34	33.0
Total	103	100.0
Recognition in Efforts Towards Innovation Influences OER Use		
	Frequency	Percent
Very important	29	28.2
Somewhat important	25	24.3
Not at all important	15	14.6
N/A or No Answer	34	33.0
Total	103	100.0
Support From Administration Influences OER Use		
	Frequency	Percent
Very important	33	32.4
Somewhat important	24	23.5
Not at all important	11	10.8
N/A or No Answer	34	33.3
Total	102	100.0
Missing	1	

Hardware or Software to Facilitate Influences OER Use		
	Frequency	Percent
Very important	45	43.7
Somewhat important	21	20.4
Not at all important	4	3.9
N/A or No Answer	33	32.0
Total	103	100.0
Desire to Reduce Costs for Students Influences OER Use		
	Frequency	Percent
Very important	49	47.6
Somewhat important	19	18.4
Not at all important	2	1.9
N/A or No Answer	33	32.0
Total	103	100.0
Environmental Concerns (Preserving Paper) Influences OER Use		
	Frequency	Percent
Very important	30	29.1
Somewhat important	27	26.2
Not at all important	12	11.7
N/A or No Answer	34	33.0
Total	103	100.0

Table 23

Preference for Open Education Resources

Preference for OER Use, Adaptation, or Creation		
	Frequency	Percent
To use OERs	22	21.4
To adapt OERs	38	36.9
To create OERs	5	4.9
N/A or No Answer	38	36.9
Total	103	100.0

Preference for Open Education Resource use

Participants were asked about their preference of use for OERs and whether they prefer to use, adapt, or create OERs. The question allowed the sample to respond with whether they prefer to use, adapt, or create OERs. They could also select not applicable or no answer for this

question. Results indicated that 21% prefer to use OERs, 37% adapt them, 5% create them, and 37% selected not applicable.

Open Education Resource Creation Factors

The next section of the survey focused on factors with influence creation of OERs. The sample was asked about creation factors and knowledge, time, academic quality, supporting expertise, recognition, support from administration, hardware or software, desire to reduce student costs, and environmental concerns. The participants could select if these factors were "very important," "somewhat important," "not at all important," or "not applicable." When asked about knowledge and creation of OERs, 50% indicated very important, 9% somewhat important, 5% not at all important, and 36% not applicable. Another question asked about the time it took to find, select, and review OERs and influence on creation. Fifty-one percent selected very important, 10% somewhat important, 4% not at all important, and 35% not applicable. The sample of dental hygiene educators was also asked about various factors which might affect whether they create OERs.

When it came to academic quality and creation, 53% of the educators chose very important, 10% somewhat important, 1% not at all important, and 36% not applicable. The data for the question about supporting expertise and creation indicated that 45% of participants selected very important, 15% somewhat important, 5% not at all important, and 35% not applicable. The next question focused on recognition of efforts for innovation of OERs and creation. Twenty-seven percent of the sample indicated this was very important, 20% somewhat important, 18% not at all important, and 35% not applicable. When asked about support from administration and influence of OER creation, 40% said it was very important, 19% somewhat important, 6% not at all important, and 35% not applicable.

Another question was regarding hardware and/or software and its influence on OER creation. Forty-seven percent of participants selected very important, 15% somewhat important, 3% not at all important, and 35% not applicable. The responses for the desire to reduce costs for students and influence of OER creation were similar to the data from the previous question about software. Forty-seven percent of respondents selected that desire to reduce costs was very important, 13% somewhat important, 5% not at all important, and 35% not applicable. The next question asked about environmental concerns and creation of OERs. Thirty percent selected very important, 24% selected somewhat important, 11% selected not at all important, and 35% selected not applicable.

The last question in the section about OER creation was focused on the types of OERs which the educators had created, or were in the process of creating. The options for this question included: textbooks, lessons, software, games, quizzes, audio, video, case studies, tutorials, or other. The results indicated that 1% created OER textbooks, 1% created OER software, and 3% created OER games. Six percent responded they had created audio type OERs, 16% indicated they created multiple types of OERs, and 71% selected not applicable. Two percent of the sample selected that they had created other types of OERs. The participants were given the open to answer an open-ended question about the “other” type of OER that was created, but none of the sample provided an answer indicating what “other” type it was.

When examining the data related to OER creation, it is interesting to note again, the consistency of the sample who responded in the not applicable category. The questions with influencing factors for OER creation included 35%-36% of the sample responding with “not applicable.” The data showed that the participants selected time, academic quality, hardware and/or software, and the desire to reduce student costs as being greater influential factors

regarding OER creation compared to the other categories. In contrast, recognition for efforts in innovation with OERs and environmental concerns were considered to be less important in influencing OER creation by this particular sample.

Table 24

Open Education Resource Creation Factors

Knowledge Influences OER Creation		
	Frequency	Percent
Very important	52	50.5
Somewhat important	9	8.7
Not at all important	5	4.9
N/A or No Answer	37	35.9
Total	103	100.0
Time to Find, Select, and Review Influences OER Creation		
	Frequency	Percent
Very important	53	51.5
Somewhat important	10	9.7
Not at all important	4	3.9
N/A or No Answer	36	35.0
Total	103	100.0
Academic Quality of Materials Influences OER Creation		
	Frequency	Percent
Very important	55	53.4
Somewhat important	10	9.7
Not at all important	1	1.0
N/A or No Answer	37	35.9
Total	103	100.0
Supporting Expertise Influences OER Creation		
	Frequency	Percent
Very important	46	44.7
Somewhat important	16	15.5
Not at all important	5	4.9
N/A or No Answer	36	35.0
Total	103	100.0
Recognition in Efforts Towards Innovation Influences OER Creation		
	Frequency	Percent
Very important	28	27.2
Somewhat important	20	19.4
Not at all important	19	18.4
N/A or No Answer	36	34.9
Total	103	100.0

Support from Administration Influences OER Creation		
	Frequency	Percent
Very important	41	40.2
Somewhat important	19	18.6
Not at all important	6	5.9
N/A or No Answer	36	35.3
Total	102	100.0
Missing	1	
Hardware or Software to Facilitate Influences OER Creation		
	Frequency	Percent
Very important	48	46.6
Somewhat important	16	15.5
Not at all important	3	2.9
N/A or No Answer	36	35.0
Total	103	100.0
Desire to Reduce Costs for Students Influences OER Creation		
	Frequency	Percent
Very important	48	46.6
Somewhat important	14	13.6
Not at all important	5	4.9
N/A or No Answer	36	35.0
Total	103	100.0
Environmental Concerns (Conserving Paper) Influences OER Creation		
	Frequency	Percent
Very important	31	30.1
Somewhat important	25	24.3
Not at all important	11	10.7
N/A or No Answer	36	35.0
Total	103	100.0
Have you Created, or are you Now Creating any of the Following for Open Access?		
	Frequency	Percent
Textbooks	1	1.0
Software	1	1.0
Games	3	2.9
Audio	6	5.8
Other	2	1.9
Multiple	17	16.5
N/A or No Answer	73	70.9
Total	103	100.0

Training Interest in Open Education Resources

The last section of the survey on OERs asked about training interest in various categories regarding OERs. The questions asked if there was interest in attending training in face-to-face

meetings, online training seminars, receiving information via email, or accessing information through a website or joining an online group. The training categories which were listed in the survey included: interest in finding OERs, information about OER textbooks, authoring OER textbooks, the peer review process of OERs, copyright process, working in teams to develop OERs, open access efforts, and licensing OERs.

When asked about training interest in finding OERs, 2% of the sample were interested in face-to-face training, 40% online training, 13% email type training information, 6% training through a group or website, and 39% selected not applicable. Training interest in OER textbooks also had similar results with 1% interested in face-to face training, 37% online training, 16% email training, 8% website or a group, and 38% not applicable. Another question asked about training interest in authoring OER textbooks. Four percent were interested in face-to-face training, 30% online training, 16% email, 7% website or group, and 43% not applicable.

The next question asked about training interest in peer reviewing OERs. Two percent of the sample were interested in face-to-face training, 32% online training, 16% email, 8% website or group, and 42% not applicable. Another question asked about training interest in how to copyright OERs. Four percent indicated interest in face-to-face training, 30% online training, 16% email, 7% website or group, and 43% not applicable. A similar question asked about interest in training regarding licensing OERs. Five percent were interested in this training face-to-face, 30% online, 12% email, 8% website or group, and 45% not applicable.

The last questions in this category inquired about training interest in working in teams to create OERs and open access efforts. When it came to training interest in working in teams to create OERs, 9% would want training face-to-face, 26% online, 10% email, 9% website or group, and 46% not applicable. The last question about training interest and open access efforts

revealed that 3% wanted face-to-face training, 30% online, 16% email, 5% website or group, and 46% not applicable.

Overall, when examining the results relating to training interest and OERs, the results indicated that most of the dental hygiene educators who were interested in training wanted it to be in an online format. Only one to nine percent of the sample were interested in attending a face-to-face type OER training depending on the topic. Some of the educators were also willing to receive OER training via email with results showing 10%-16% interest depending on the topic of the training. Furthermore, results demonstrated that the topic with the most significant interest was training in finding OERs. Other topics with more significant interest among this sample was using OER textbooks and working in teams to create OERs. The topic with the least amount of training interest in this sample included licensing OERs.

Table 25

Training Interest in Open Education Resources

Training Interest in Guidelines to Find OERs		
	Frequency	Percent
Attend face to face workshop	2	1.9
Attend online workshop	41	39.8
Receive information via email	14	13.6
Access information through a website or join a group	6	5.8
N/A or No Answer	40	38.8
Total	103	100.0
Training Interest in Open Access Textbooks		
	Frequency	Percent
Attend face to face workshop	1	1.0
Attend online workshop	38	36.9
Receive information via email	17	16.5
Access information through a website or join a group	8	7.8
N/A or No Answer	39	37.9
Total	103	100.0
Training Interest in Guidelines for Authoring Open Access Textbooks		
	Frequency	Percent
Attend face to face workshop	4	3.9
Attend online workshop	31	30.1
Receive information via email	17	16.5
Access information through a website or join a group	7	6.8
N/A or No Answer	44	42.7
Total	103	100.0
Training Interest in Peer Reviews of Open Access Texts, Guidelines, and Processes		
	Frequency	Percent
Attend face to face workshop	2	1.9
Attend online workshop	33	32.0
Receive information via email	17	16.5
Access information through a website or join a group	8	7.8
N/A or No Answer	43	41.7
Total	103	100.0
Training Interest in Copyright and Intellectual Property Related to OERs		
	Frequency	Percent
Attend face to face workshop	4	3.9
Attend online workshop	31	30.1
Receive information via email	17	16.5
Access information through a website or join a group	7	6.8
N/A or No Answer	44	42.7
Total	103	100.0
Training Interest Working in a Team to Develop OERs		

	Frequency	Percent
Attend face to face workshop	9	8.7
Attend online workshop	27	26.2
Receive information via email	10	9.7
Access information through a website or join a group	9	8.7
N/A or No Answer	48	46.6
Total	103	100.0
Training Interest in Promoting Recognition of Open Access Efforts		
	Frequency	Percent
Attend face to face workshop	3	2.9
Attend online workshop	31	30.1
Receive information via email	16	15.5
Access information through a website or join a group	5	4.9
N/A or No Answer	48	46.6
Total	103	100.0
Training Interest in how to License OERs Appropriately		
	Frequency	Percent
Attend face to face workshop	5	4.9
Attend online workshop	31	30.1
Receive information via email	12	11.7
Access information through a website or join a group	8	7.8
N/A or No Answer	47	45.6
Total	103	100.0

Dental Hygiene Educators' use of Open Education Resources

The first research question of this study is concentrated on dental hygiene educators and their use of OERs. As mentioned in previous chapters, no studies to date have been focused on OERs and dental hygiene education. It was intriguing to utilize exploratory data analysis to examine data regarding OERs and dental hygiene educators. Prior to this study it was unknown how many dental hygiene educators knew what OERs were and also how many were using them. The results of this study indicated that approximately 72% of the participants are at least somewhat familiar with OERs (Table 12). This statistic illustrates that there is a reasonable level of familiarity with what OERs are, although this could certainly be a higher percentage.

Since it is now known that a moderate level of dental hygiene educators are familiar with OERs, it was also important to examine how many are actually using them, as this was previously unknown. The results of the survey show that 46% of the dental hygiene educators report they are using OERs, while 54% say they are not. Of the educators in the survey who report using OERs, slightly more reported using supplementary text OER materials (27%) than OER textbooks (23%) (Table 13). Another interesting finding was that 43% of those who use OERs reported using "other" types of OERs. Open ended responses linked to the survey question about the use of "other" type materials indicated that these "other" materials were related to board examination preparation materials or resources created by other dental hygiene educators. It seems the dental hygiene educators in this sample who are using OERs, are using primarily "other" resources (47%) compared to the amount using OER textbooks (23%) and supplementary OER text materials (27%) (Table 13).

Another factor which can influence use of OERs in dental hygiene education is the ability to select course resources. According to the results of the survey, approximately 50% of the educators were not solely responsible for selecting their course resources (Table 11). Some shared responsibility for selecting course materials with a colleague, and others had resources chosen for them by the department chair or director. This means half of the participants are not able to choose their own course resources. This factor could impact how OERs might be utilized in dental hygiene programs if the educators who are willing to utilize OERs are unable to because traditional course materials are selected for them.

The perception of value and quality of OERs was also explored. Overall, 44% of the educators perceived OERs to be similar or higher in quality than traditional resources, with 53% of the sample selecting the "not applicable" option (Table 17). There were similar results in the

questions exploring the perceived value of OERs compared to traditional resources. Generally 1%-5% of the sample who was able to rank value of OERs perceived the different types of OERs to be less valuable than traditional course resources (Table 17). This sample indicated that OERs were both similar in quality and value to traditional educational resources. These statistics also align with the review of the literature in which both educators and students perceived OERs as valuable (Hilton, 2019; Lin, 2019).

In the literature, reduction of student debt, and therefore increased retention, was viewed as a benefit of utilizing OERs (Colvard et al, 2018; Hilton, 2016). The results of the survey from the section that examined cost reduction potential of OERs was less conclusive within this sample. Generally, 68%-78% of the sample of dental hygiene educators selected not applicable to the questions about cost reduction due to OERs (Table 18). Of those who did select answers relating to cost reduction capabilities of OERs, 14%-21% indicated that the different types of OERs would offer any significant cost reduction to students (Table 18). The types of OERs that were perceived as having more cost saving potential were OER journal access, videos, and case studies. While it is not conclusive why the sample believed these types of OERs to be better at reducing student costs, it may be related to the nature of dental hygiene education and the "other" OER types that the educators reported to be using more frequently compared to OER textbooks or lessons.

Another section of the survey examined the ease of use of specific types of OERs. There was a smaller percentage of dental hygiene educators which answered these questions with something other than "not applicable" than the previous sections. Fifty-nine to eighty percent of the educators selected "not applicable" in the questions asking about ease of use depending on the specific OER (Table 19). The participants perceived OER videos and scholarly journals to be

the easiest to use. In contrast, they felt that OER software and lessons were not as easy to use. It appears that few of the educators in the sample were able to evaluate ease of use of OER games, as 80% selected not applicable (Table 19). These results also allude to the possibility that dental hygiene educators are more likely to try using certain types of OERs compared to others and therefore were unable to rank how easy it is to use certain types of OERs.

The literature around OERs has indicated that generally students tend to view them as more engaging and valuable than traditional resources (Hilton et al, 2019; Lin, 2019). Furthermore, while the literature has mixed results on how OERs affect student achievement, it is clear that OERs are not detrimental to learning outcomes (Hardin et al, 2019). This has affected students and their likeliness to search out courses which utilize OERs (Lin, 2019). In this study, there was a question about willingness to use OERs. When it came to the sample of dental hygiene educators, 57% indicated they were at least somewhat likely to use OERs in their courses (Table 20). A similar survey question about OER preference, illustrated that the sample of educators preferred to adapt OERs rather than simply create or use them. Thirty-seven percent wanted to adapt OER materials, compared to the 21% who preferred to use them, and the 5% who wanted to create them (Table 23). This data is interesting in that more than 50% of the sample would be open to using OERs, and the majority would rather adapt them to their own needs. There seems to be a willingness to attempt to use OERs, and even more so with the types of OERs which can be adapted to fit specific needs of the dental hygiene educators.

Barriers to Open Education Resources

Another research question from this study was focused on the barriers to OERs related to the specific discipline of dental hygiene education. In the literature about OERs, the biggest barriers to implementation were: time to find quality OERs and adapt them, copyright

considerations, and lack of institutional support (Hassall et al, 2017; Wiley et al, 2014). In this study, the dental hygiene educators were asked about what factors influence their use of OERs. They were asked about specific factors relating to OERs such as: knowledge of OERs, time to find and adapt OERs, academic quality, supporting expertise, recognition for using OERs, support from administration, the hardware/software of OERs, the desire to reduce costs to students, and environmental concerns. The items which were selected as being most influential in how this sample of educators utilized OERs were knowledge of OERs, time to find and adapt them, and academic quality of the OERs. What was interesting was that out of the sample of educators who ranked different influential factors for OERs, not one of them ranked time to find OERs as being non-influential. Sixty-seven percent of the sample (the other 33% selected not applicable) indicated that time to find and adapt OERs was at least somewhat influential in determining if they use them (Table 7). Similarly, none of the participants ranked academic quality of OERs as not important for influencing use of OERs. Academic quality was also rated by 67% of the sample as being somewhat important while the other 33% selected not applicable.

This sample of educators also ranked knowledge and quality of OERs as being highly influential for determining use of OERs. This data also aligns with the research by Wiley et al, regarding how barriers of OERs are related to knowledge and effectiveness in finding and adapting OERs (2014). Another factor that was ranked as fairly influential was the amount of support from administration. Fifty-eight percent of the dental hygiene educators felt that support from administration was at least somewhat influential in whether they utilized OERs (Table 7). Eleven percent of participants felt support from administration was not important, and the other 34% selected not applicable (Table 7). It would be interesting to know if the 11% of educators

who felt that support from administration was not important, felt this way because time to find the OERs and/or the quality of OERs was a more significant barrier.

There were two factors which were viewed as less influential for OER use by this sample. Recognition for use of OERs and environmental concerns were seen as not influential by a larger proportion of the sample. Another factor that was seen as only slightly influential was supporting expertise from those who use OERs. Ten percent of participants felt that supporting expertise was not influential (Table 7). It would also be helpful to know if this was due to the fact that the educators had previous bad experiences working with others who provided the supporting expertise, or if they saw a lack of supporting expertise all together within the discipline of dental hygiene.

The last potential barrier which should be addressed is related to the ability of the dental hygiene educators to select if they use OERs. As previously mentioned, over 50% of the dental hygiene educators in the study were not fully responsible for selecting their own course resources. Fifty-one percent of the sample either had their course resources selected for them, or they had to share responsibility for selection with a colleague (Table 11). This could potentially impose a barrier on dental hygiene educators who wish to utilize OERs, but are unable to because the educator who shares responsibility for selection of course resources does not wish to use OERs. As previously mentioned, more than 50% of the survey participants were interested in using OERs. So while the interest is there, the ability to actually adopt OERs may not be attainable due to the person(s) responsible for determining selection of course materials.

Factors Which Influence Dental Hygiene Program Open Education Resource adoption and use

In previous sections, it was noted that the sample of dental hygiene educators reported they were likely to adapt or use OERs if they were able to. When asked about which OERs, they were likely to create, 39% indicated they were at least somewhat likely to create OER quizzes and tutorials, 34% were at least somewhat likely to create OER audio, and 44% OER video (Table 21). The areas which were ranked as not likely to create was over 50% of the sample for OER textbooks and software.

While the previous section focused on barriers to OER use, it is also important to note that there are other influential factors which affect OER use, that are not necessarily impediments, but rather motivational. One of these factors is the desire to reduce educational costs to students. The literature around OERs focuses heavily on OERs' abilities to reduce costs to students, and therefore provide positive effects in retention (Colvard et al, 2018; Mathew et al, 2019; Senack, 2014). When asked about desire to reduce costs to students and how influential this is to using OERs, 66% of the dental hygiene educators indicated that it was at least somewhat influential (Table 22). Two percent said it was not an influential factor and 32% selected not applicable. It appears, that for this sample of dental hygiene educators, there is a strong desire to decrease the cost of educational resources for students.

Another motivational type factor which might influence use of OERs, is recognition for adoption and use. While 15% of the sample said this was not an influential factor, there were still 52% that indicated that this was at least somewhat influential regarding use of OERs (Table 22). The factor of support from administration was ranked very similarly to recognition. If you compare these two elements, it may be prudent to consider that support from administration and

recognition together could drive even higher motivation to use OERs if educators are supported in efforts to utilize OERs and are recognized for doing so.

One last area to ponder concerning use of OERs, is the interest in training opportunities relating to OERs. The dental hygiene educators were asked about training interest related to finding OERs, use of OER textbooks, authoring OER textbooks, peer reviewing OERs, copyright considerations, working in teams to create OERs, open access efforts, and licensing considerations. The educators could select what type of training if any, they were interested in for each topic, such as face-to-face training, online, email information, or website or group type information. For each training topic, the majority who were interested in training wanted it to occur online or through email. There were also approximately 54%-62% who were interested in training depending on the topic (Table 25). There was most interest in training about finding OERs and use of open textbooks. There was the least amount of interest in licensing OERs and working in teams to create OERs. This information is quite helpful for considering that while it is obvious that there is interest in training about OERs, there is less interest in it occurring through face-to-face conferences and more in the online environment. Furthermore, there is greater interest in training about finding OERs and using open textbooks than there is about licensing or copyright issues. Perhaps the best approach for OER training in the discipline of dental hygiene would be an online seminar about finding and using OERs with emphasis on OER textbooks and optional information via email or website on the other topic areas.

Results of Open-Ended Questions

The instrument used for this study included a few opportunities for participants to leave comments with additional follow-up information if they felt it was applicable. The survey questions which allowed for open-ended responses included: “other factors” which were not

listed which might influence the use of OERs, why educators preferred to use, adapt, or create OERs, and other places not listed in the survey where they found OERs. The educators were given the opportunity to type in responses to give greater detail for each of the open-ended questions.

The first question with an open-ended response was related the use of OERs. The question asked the participants of there were any other factors which affected their choice to use OERs. Three participants answered the open-ended question with a response. One participant indicated that using OERs "provides a well-rounded education for the students for a particular course." Another educator provided feedback that another factor which influences their choice to use OERs is "students with learning issues." The last influencing factor for use of OERs that was mentioned in the feedback was simply "cost." It was unclear whether cost was seen as a positive or negative influential factor of use for OERs from this particular educator, but it was clearly important enough for them to leave a comment about it.

The next opened-ended portion of the survey was about the educators' preference to use, adapt, or create OERs. The question simply asked the reason behind their preference. Thirty-two participants provided details about why they prefer to use, adapt, or create OERs. The majority of responses were related to using or adapting OERs, with only one educator indicating they were creating their own OER. Common themes in the responses were related to the lack of time to create OERs, the perceived benefit of adapting OERs to fit the needs of the students, and the need for more OERs which are ready to use for the dental hygiene discipline. One educator noted they prefer to use OERs because "I am an adjunct clinical instructor, so I will only use OERs that someone else in our department has set up for as adjuncts." Another participant stated they prefer to use OERs because of "reduced costs to students as well as more engaging materials which are

available as OERs.” Six other educators responded they prefer to use OERs simply because they do not have time to spare for adapting or creating OER resources.

When examining the same question for preference of OERs, many indicated they prefer to adapt OERs. One identical comment that was seen by four different educators was about preferring to adapt OERs because they didn’t want to “reinvent the wheel.” There was also a desire to customize materials to students’ needs, but without having to spend the copious amount of time creating. One educator indicated they prefer to adapt OERs because they want to “have the ability to customize materials and use what works best for each course.” Five participants indicated they adapt OERs because they like to customize the materials they use for instruction. Two other participants indicated that felt there was a need to learn more about OERs before they would create them, so they chose to just adapt what was already available. Another educator stated that they adapt OERs but they “want materials from experts, frequent users, or knowledgeable people in the field of dentistry or DH education.”

There were very few participants who indicated they would prefer to create OERs in the open-ended reposes. One educator indicated they were currently creating their own OER. There were some, however, who said they would be interested in creating OERs if they had more experience and time to do so. Another theme noted in the responses was the lack of knowledge about OERs in DH education. One educator stated “I know very little about OER; I was told by a colleague there isn’t any OER available for DH.” Another indicated, “I am not familiar with OERs, not have I used them, so I would not yet know how to adapt or create them.”

The last section of the survey with open-ended questions was the portion which provided the participants the option to indicate an “other” source where they found OERs if the option was not already present in the survey question. Sixteen of the educators responded to the open-ended

question. Nine of the participants indicated they were not using OERs. One educator stated that "the clinical director set up what I am using for me." Another indicated they "use textbooks of my own, on-line resources through ADA, supplemental resources from other instructors, and previous board exams as OER." One educator stated they are creating their own OER, another that they found their OER from a textbook publisher, and another from their colleagues in their department. One educator commented that, "I haven't looked recently, but I didn't find much that was relevant to the courses I teach." A similar statement from another participant indicated that "DH does not use OERs, but other programs on our campus do."

Conclusion

Utilizing exploratory data analysis to examine the use of OERs within dental hygiene education was quite exciting. It was not known how the specific discipline was utilizing OERs or if it was still a widely unknown element in this educational realm. Now that we know more about OERs and their function and role in dental hygiene education, there are a few themes to focus on for future consideration.

While there is all sorts of exciting data about OERs and dental hygiene education, an important thing to remember is that there was a greater percentage of dental hygiene educators who were willing to use OERs, than are actually using them. The data showed there was a high percentage of the educators who were familiar with OERs and willing to use them. There is somehow something that is preventing those who are interested in using them, from implementation.

Another unexpected finding in the data, was the fact that over half of the dental hygiene educators in the study were not solely responsible for choosing their own course resources. They had someone else either working with them or telling them what resources to use for their

courses. This is such a vital piece of data, as it demonstrates that there is a barrier to use of OERs, which was previously unknown and probably overlooked. There should be additional consideration into why educators are not allowed to choose their own course resources. Also consideration should be given to if further institutional guidance should be implemented in order to allow instructors freedom to use OERs if they desire. This would allow those who wish to improve student achievement thorough decreasing costs and driving retention to ability to focus efforts in those areas.

The data also indicated there was definite interest in training opportunities related to OERs. Many of the educators ranked specific training opportunities related to OERs as interesting to them. Whenever there is interest in an educational pedagogy which can effect student engagement and retention, consideration should be given to offering those opportunities. Now that there is baseline knowledge about the level of interest in specific topics related to OERs, efforts should be made to facilitate training opportunities. These training efforts could be within the discipline, or even cross-disciplinary.

Prior to this study, it was unknown what the dental hygiene education discipline was doing with OERs and if they even knew what OERs were. Dental hygiene programs and the educators which support them, are diverse and have varying needs. This data helps set a baseline for what dental hygiene educators know about OERs, if they are using them, or even willing to use them. It also helps provide data for previously unknown barriers to adoption of OERs and what training is most interesting to dental hygiene educators. This data will be useful for determining future guidance in adoption of OERs and training opportunities for those teaching in the discipline of dental hygiene.

Chapter Five

Introduction

This EDA study set out to gather information that would help inform dental hygiene educators about OERs and their status in DHE programs across the United States. Prior to this study, there were no studies which examined OER use within dental hygiene education. For that reason, the researcher of this study did not set hypotheses, but rather went into the research with an open mind and an intent to gather useful data in order to form hypotheses which can be explored with future research. The results of this study provided some interesting data which can help set the foundation for future research of OERs and dental hygiene education.

Discussion

When examining the results of this study, there were a few main themes which were prominent in the data. These themes can offer insight into relevant future research opportunities and help develop hypotheses for various research designs. The first theme that was noted, was that the dental hygiene educators seemed to have a high level of familiarity with OERs and were willing to use them. Since the educators are familiar with OERs, opportunities with OERs should be focused on supporting adaptation or adoption of OERs instead of teaching the educators about OERs. Furthermore, this sample of educators indicated they perceived that OERs had value and the potential to save students money. They also indicated that they were interested in using and even creating some types of OERs. This data leads the first hypothesis which could be used for future research. More dental hygiene educators will utilize OERs if they are provided with the resources they need to adopt them.

Another area of interest in the data is that, while there is general interest in using and even creating OERs, not all dental hygiene educators have the ability to use OERs. Many of the

educators in this sample indicated that a department chair or director selected the course resources. Or in some cases, the selection of course resources was shared with another educator who may not want to adopt OERs into the course. If that is the case, then the educators may not be able to use OERs even if they have a great desire to do so. If dental hygiene educators struggle with an inability to select their own course materials, it will effect motivation to innovate and implement OERs. Educators may feel constrained and lack motivation to add OER resources to their courses if they cannot select the materials they use. This leads to the next hypothesis for future research. Dental hygiene educators will adopt OERs given they have the opportunity to select their own course resources.

Considering a major barrier to use of OERs which was determined in the data analysis was the inability of instructors to select their own resources, it may be beneficial to consider the power of decision making within the DHE discipline in order to drive change. If administrators such as program directors, or department chairs are selecting course resources for the educators, they may not know of the benefits of OERs, or are more comfortable with adopting traditional resources. This needs to be researched more thoroughly. In the meantime, certain professional organizations and/or policy makers should consider adding emphasis on utilizing OERs within the discipline in order to support student retention as is evidenced in the literature (Colvard et al, 2018; Hilton, 2016; Mathew et al, 2019; Senack, 2014). CODA sets the accreditation standards for DHE programs in the United States, they could create an educational standard which would encourage OER use in a certain amount of courses. The ADHA and ADEA could offer training around OERs and support their use by advocating for OER repositories to be created for the discipline and start using them in their professional continuing education efforts. Big changes towards OER use, could start with small actions by the professional organizations.

The next theme which was noted, was the interest in training opportunities regarding OERs. A large portion of the sample was interested in learning more about a breadth of topics surrounding OERs such as how to use them, create them, license them, etc. This interest in training demonstrates that there is at least a willingness to use OERs, in that the educators would take time to learn about them. The interest in training about OERs also lead the researchers to ponder if an established OER repository for dental hygiene educators, such as other professions already have, would also drive interest in adopting OERs. This topic was not addressed in this study, but would provide helpful information for future research on OERs and dental hygiene education. Therefore an interesting question for future research would be whether an OER repository for the discipline of dental hygiene education or even dental education would facilitate increased use of OERs. It is clear from the data in this study that the dental hygiene educators were interested in finding quality OERs, not only in the quantitative survey data, but also from the comments in the qualitative open-ended responses.

Use of OERs should be considered for both research and good pedagogy. Use of OERs can be cost-effective for students and therefore, positively effects retention. Retention matters for professional programs and administrators. Health care professionals are in high demand and retention of students in the programs is beneficial not only through the tuition funding to the institution, but also to the impact the students will bring to communities when they graduate and seek employment. Utilization of OERs can help provide engaging and relevant course materials in a cost-effective manner. This could facilitate continued enrollment in a manner which does not require significant institutional investments. Future research hypotheses could focus on the cost-savings students experienced through the use of OERs in their dental hygiene program. A

potential research question could be to inquire about the amount of money saved by students through dental hygiene programs due to the use of OERs.

While the questions in this research did not focus on specific geographic locations, the sample however, was stratified and did include diverse program locations. In future research, it would be interesting to determine if program type or geographic location effects the use of OERs. The survey could be modified to include questions about which state or region the educator was working. A potential hypothesis for future research in this topic area might be that geographic location of the dental hygiene program has no effect on use of OERs. Furthermore, similar research could be explored regarding the years of experience in teaching the dental hygiene educators had and their use or willingness to use OERs. Another possible hypothesis might be that the years of experience an educator had would influence their use of OERs. The data from this research indicated rather extreme distributions in age with a majority of the educators being either new educators with one to five years of experience, or rather seasoned educators with more than 20 years of experience. It might be there are so many newer educators due to lack of full-time clinical opportunities, or potential early burn out in clinical dental hygiene practice. Further research should be undertaken to fully examine whether this is a normal distribution of experience level in dental hygiene educators.

One last theme which is important to note is that, while this study was quantitative and an EDA study, it did include some open-ended questions. These questions added a slight depth to the data collected, but not as much as a qualitative design study would provide. It would be beneficial for future research on the topic of OERs and dental hygiene education to utilize a qualitative approach. This would allow for exploration of the dental hygiene educators perspectives on using OERs in greater detail. It would also allow for more detailed data about the

barriers faced when implementing OERs in this particular discipline. One question which should be explored through qualitative analysis is; what barriers to OER implementation do DH educators struggle with. Another question which should be explored in dental hygiene education, comes from the students' perspective. Research should explore the dental hygiene students' perception of OERs and the impact they have on their academic performance. Similar questions have been researched in the nursing profession, but have not yet occurred in dental hygiene (Verkuyl et al, 2018).

Limitations

While the researcher of this study made reasonable efforts to promote high quality in the study design, the reliability, and the process of data collection and analysis, it is not without limitations. First, the sample of dental hygiene educators is not comprehensive or inclusive of all dental hygiene educators. The sample size while big enough for an EDA study with a sample size of 103 and a response rate of 35.6%, it was not as robust as it could have been. Also, the nature of the study was that the participant voluntarily completed an online survey, which could possibly exclude educators who did not have access to the technology to complete the survey, or preferred to take it in another manner. Another limitation, is that the participants were self-reporting their answers, which could also include inaccuracies. Additionally, this study was cross-sectional and captured data about the use of OERs during a limited time period. Perceptions and preferences about OERs could change in future.

This study could have been improved in a few ways regarding the sampling plan. The timing of the survey was during the fall term and closed the week of a holiday. It is likely that many of the DH educators were busy during this time, and leaving the survey open for longer than four weeks might have been beneficial and allowed more educators to participate. Another

option would have been to stratify the sample differently. While the sample was stratified by geographical location with the intention of being inclusive for diverse program locations, it might have been more beneficial to stratify by the size of the program instead. This would have allowed programs of various sizes to participate. It would have also been helpful for the researcher to send out more than one reminder email to the program directors regarding the study in order to bolster participation. If given the chance, the researcher would also chose to time the study with a major dental educators' conference in order to gain interest from the sample when they are already meeting to discuss important issues regarding dental hygiene education. The educators might have greater motivation to participate and greater interest in the research around OERs if the survey was timed around an ADEA or similar type conference.

Another limitation to note was regarding the instrument itself. While it was modified to fit the sample, it could have been modified with a minor change to gain more detailed information from the sample. A few of the questions did not allow for an option where the educator could select that they are not using OERs. A better option would have been to add a response which indicated that the educator is not using OERs or had no experience with them and allowed them to bypass the questions which were not applicable. The instrument could have also been improved by adding an open-ended question along with the one which inquired about interest in training. It would have been useful to have more detail about the specific types of OERs or training that the educators are interested in.

One last area which could be seen as a limitation to some, is the use of OERs in an applied field such as dental hygiene education. While it is true, that there are few existing OERs designed specifically for dental hygiene education at this time, the potential to implement them is only limited by educators' creativity. OERs can be used in an applied discipline like dental

hygiene through the use of case studies, board examination preparation materials, video tutorials, and other types of resources to help students navigate through the “applied” nature of this discipline. Dental hygiene students graduate and practice in settings where they will be asked to collaborate and utilize technology in various ways. It is meaningful to mimic those practice settings as much as possible during the educational process and this can be accomplished through the creative use of OERs. The more that students experience online case studies and navigating digital formats for learning through OERs as this will prepare them for a collaborative and technological applied field where they will be providing patient care in diverse settings and modalities.

Implications for Dental Hygiene Administrators

Dental hygiene education can be considered to be a crowded curriculum regardless of whether it is provided in a two-year or four-year format. The Commission on Dental Accreditation has numerous educational standards which must be followed to maintain status as an accredited program. There are challenges in finding space to add topics or ideas which are not required by accreditation. On the surface it may seem that use of OERs, would add work to an already crowded curriculum. This researcher would argue however, that if planned carefully, implementation of OERs could actually streamline curriculum and allow for sharing of educational resources.

As evidenced by this study, there is general interest in training opportunities for creation and use of OERs in dental hygiene education. Training workshops could be utilized as not only a calibration exercise for educators, which is required by accreditation standards, but also as an opportunity to create OERs which could be implemented at multiple institutions. Shared work in creation of OERs could assist in the creation of quality OERs for dental hygiene education with

combined resources. In many instances with traditional course resources (textbooks), they are used for multiple courses throughout the curriculum. OERs could serve the same purpose, while allowing for customization for certain student demographics. A well designed OER could take the place of one or more expensive textbooks and allow students the ability to use it for multiple classed in the curriculum. In that case, educators could work together to create an OER which would work well for their own students across the span of the curriculum. Therefore, less adaptation of materials would need to take place in this instance over time.

Another beneficial use of OERs could also be in courses which are meant to allow students to explore public health systems. For example, in community dental health courses, a traditional textbook would serve the course well and allow for proper board examination preparation, yet it would not allow for in depth education regarding local community dental health needs. An OER could provide students with a greater depth of knowledge about the surrounding community and allow DH administrators, educators, and students the opportunity to build stronger relationships with their communities. Stronger relationships in local communities may equate to increased willingness for community members to visit institutions as patients, and possibly increased visibility for grant funding opportunities.

Future Research

After reviewing the literature and analyzing the results from this study, there are recommendations which should be made for future research in the topic of dental hygiene education and OERs. The first recommendation for future study, is to implement more training opportunities for using and implementing OERs within dental hygiene education. The results of this study indicated that there was a willingness to use OERs and an interest in learning how to

use quality OERs. Therefore, future research should be focused on what OER training would be most effective for reaching the widest audience.

Another recommendation for future study should be focused around the creation of a task force of researchers and DH educators who know about OERs who can determine how to create a repository for DH specific OERs. Task force type research groups have been an effective approach in DH research in the past, and could be used to establish a DH discipline specific repository for OERs which could be accessed by a large population of DH educators. This task force should include diverse DH educators from a variety of program types in order to advocate for the most effective type of OER repository that would benefit all DH educators. The task force should also include subject matter experts in OERs from other disciplines who are already successfully utilizing OERs and OER Repositories (Feldman-Maggor et al, 2016).

Future research should also utilize a qualitative approach to examine specific barriers which prevent DH educators from using, adapting, or creating OERs. This study was able to determine that time and ability to choose resources for courses were some of the barriers which prevented educators from using OERs. It would be useful to examine these specific barriers at a deeper level, to determine how they might be overcome by interviewing different DH educators Interviewing these educators would be able to illuminate further exactly how significant the barriers are as well as any others that were not identified in this study. This type of research would help provide details into how barriers to using OERs might be overcome.

One last recommendation for future research regarding OERs and dental hygiene education is to focus on DH students and how they perceive OERs. While research on OERs and the educators is certainly important, it should not be the sole focus. Students are stakeholders

who should have a voice regarding their education. While previous research does indicate that students in higher education setting perceive OERs as being innovative and have a positive effect on their education, that is not known for certain within dental hygiene students (Hilton et al, 2019). Dental hygiene students should be a focus of future research when OERs are used as part of their education. Research could focus on the DH students' perceptions of learning through use of OERs, or whether there was an impact in student success due to pedagogy which utilizes OERs.

Conclusions

While there were many interesting discoveries in this EDA study, the most surprising finding from this research was that dental hygiene educators often do not have the ability to select the resources for their own courses. This was surprising due to the fact that this barrier to use of OERs was experienced by a large number of dental hygiene educators. This was an unexpectedly high number and a statistic that might be changed with purposeful changes and effort in the part of both dental hygiene administrators and professional organizations. It is disappointing to see that even if there is evidence-based research demonstrating that OERs can have positive outcomes for students, educators may not be able to choose to implement them in their own programs.

The most important finding from this research was the fact that there is a general awareness about OERs within the discipline of dental hygiene education. Furthermore, there is an interest in training and developing the use of OERs among the majority of the sample in the study. What is most significant is although most of the educators who participated in the study were unable to select the course resources they use on their own, they are still willing to learn

more about OERs. This indicated that they see value in OERs and their ability to help students' save money and progress in their dental hygiene education journey.

The use of OERs in education benefits student success and retention in programs due to access and cost savings (Colvard et al, 2018; Hilton, 2016; Mathew et al, 2019; Senack, 2014). Students in higher education settings also view OERs as engaging and valuable as it decreases overall cost of education (Hilton, 2019; Lin, 2019). Dental hygiene educators should also consider these topics as important for the success and retention of their students. They should consider adopting and sharing OERs in order to help maintain students' enrollment and success in the DHE programs. Policy making entities and professional organizations such as CODA, ADEA, ADHA, and the administrators in the DHE programs should consider ways in which they can set policies or change rules in order to foster adoption and use of OERs. All of these efforts which drive innovation in pedagogy through the use of OERs, can assist dental hygiene educators improve retention and success in their programs.

References

Adams, A., Liyanagunawardena, T., Rassool, N., & Williams, S. (2013). Use of open educational resources in higher education. *British Journal of Educational Technology*, 44(5), E149-E150.

American Dental Association. (2020). Dental hygienist education. https://www.ada.org/en/education-careers/careers-in-dentistry/dental-team-careers/dental-hygienist/education-training-requirements-dental-hygienist

American Dental Education Association. (2020). About ADEA. https://www.adea.org/about_adea/Pages/default.aspx

American Dental Hygienists' Association. (2020). About ADHA. https://www.adha.org/about-adha

American Dental Hygienists' Association. (2017). Dental hygiene programs. http://www.adha.org/resources-docs/71617_Entry_Level_Schools_By_States.pdf

American Dental Hygienists' Association. (2013). The origin and history of dental hygienists. *Journal of Dental Hygiene. 87 (suppl 1) 58-62.* https://jdh.adha.org/content/jdenthyg/87/suppl_1/58.full.pdf

Clinton, V., & Khan, S. (2019). Efficacy of open textbook adoption on learning performance and course withdrawal rates: a meta-analysis. *AERA Open*, *5*(3).

Colvard, N. B., Watson, C. E., & Park, H. (2018). The impact of open educational resources on various student success metrics. *International Journal of Teaching and Learning in Higher Education*, *30*(2), 262–276.

Commission on Dental Accreditation. (2019). Accreditation standards for dental hygiene programs. https://www.ada.org/~/media/CODA/Files/dental_hygiene_standards.pdf?la=en

Commission on Dental Accreditation. (2020). Commission on dental accreditation. https://www.ada.org/en/coda

Coughlan, T., & Perryman, L.A., (2011). Something for everyone? The different approaches of academic disciplines to open educational resources and the effect on widening participation. *Journal of Open, Flexible and Distance Learning*, *15*(2), 11–27.

Feldman-Maggor, Y., Rom, A., & Tuvi-Arad, I. (2016). Integration of open educational resources in undergraduate chemistry teaching--A mapping tool and lecturers' considerations. *Chemistry Education Research and Practice*, 17(2), 283–295.

Hardin, E. E., Eschman, B., Spengler, E. S., Grizzell, J. A., Moody, A. T., Ross-Sheehy, S., & Fry, K. M. (2019). What happens when trained graduate student instructors switch to an open textbook? A controlled study of the impact on student learning outcomes. *Psychology Learning and Teaching*, *18*(1), 48–64.

Hassall, C., & Lewis, D. (2017). Institutional and technological barriers to the use of open educational resources (OERs) in physiology and medical education. *Advances in Physiology Education*, 41(1), 77-81.

Hilton, J. (2016). Open educational resources and college textbook choices: a review of research on efficacy and perceptions. *Educational Technology Research & Development*, *64*(4), 573–590.

Hilton, J., III, Wiley, D., Chaffee, R., Darrow, J., Guilmett, J., Harper, S., & Hilton, B. (2019). Student perceptions of open pedagogy: an exploratory study. *Open Praxis*, *11*(3), 275–288.

Hoaglin, D., Mosteller, F., & Tukey, J.W. (1983). *Understanding robust and exploratory data analysis*. New York, NY: Wiley.

Islim, O. F., Gurel Koybasi, N. A., & Cagiltay, K. (2016). Use of open educational resources: how, why and why not? *International Journal of Teaching and Learning in Higher Education*, 28(2), 230–240.

Lane, A. (2010). Designing for innovation around OER. *Journal of Interactive Media in Education*, 1, (2). http://doi.org/10.5334/2010-2

Lane, A., & McAndrew, P. (2010). Are open educational resources systematic or systemic change agents for teaching practice? *British Journal of Educational Technology, 41*(6), 952-962.

Lin, H. (2019). Teaching and learning without a textbook: undergraduate student perceptions of open educational resources. *International Review of Research in Open and Distributed Learning*, 20(3), 1–18.

Mathew, S., & Kashyap, U. (2019). Impact of OER materials on students' academic performance in an undergraduate astronomy course. *Journal of STEM Education: Innovations and Research*, *20*(1), 46–49.

McKerlich, R., Ives, C., & Mcgreal, R. (2013). Measuring use and creation of open educational resources in higher education. *International Review of Research in Open and Distance Learning*, 14-4.

Merriam-Webster. (2020). Dictionary definitions. https://www.merriam-webster.com/dictionary/clinical?src=search-dict-box

Oxford Learner's Dictionary. (2020). Definition of discipline. https://www.oxfordlearnersdictionaries.com/us/definition/english/discipline_1

Patricia, C. C. S., del Rocio, R. M. G., & Elizabeth, R. P. A. (2010). OER's production cycle with social authorship and semantic tools. *Education Engineering*, 2010 IEEE, 121–128. 10.1109/EDUCON.2010.5492588

Piña, A. A., & Moran, K. A. (2018). Effects of an open educational resources initiative on students, faculty and instructional designers. *Online Journal of Distance Learning Administration, 21*(2), 1-12.

Rahayu, U., & Sapriati, A. (2018). Open educational resources based online tutorial model for developing critical thinking of higher distance education students. *Turkish Online Journal of Distance Education*, *19*(4), 163–175.

Senack, E. (2014). Fixing the broken textbook market: How students respond to high textbook costs and demand alternatives. U.S. Public Interest Research Group. https://uspirg.org/sites/pirg/files/reports/NATIONAL%20Fixing%20Broken%20Textbooks%20Report1.pdf

Tukey, J. (1977). *Exploratory data analysis*. Reading, MA: Addison-Wesley Pub.

Tuomi, I. (2006). Open educational resources: what they are and why do they matter. *OECD.* (pp. 1–44). http://www. meaningprocessing.com/personalPages/tuomi/articles/OpenEducationalResources_OECDreport.pdf

Tuomi, I. (2013). Open educational resources and the transformation of education. *European Journal of Education*, 48(1), 58-78.

United Nations Educational, Scientific, & Cultural Organization. (2019). Open educational resources. Retrieved from: https://en.unesco.org/themes/building-knowledge-societies/oer

Van Acker, F., Vermeulen, M., Kreijns, K., Lutgerink, J., & Van Buuren, H. (2014). The role of knowledge sharing self-efficacy in sharing Open Educational Resources. *Computers in Human Behavior*, 39(C), 136-144.

Venegas-Muggli, J.I., & Westermann, W. (2019). Effectiveness of OER use in first-year higher education students' mathematical course performance. *International Review of Research in Open and Distributed Learning*, *20*(2), 204-221.

Verkuyl, M., Lapum, J., St-Amant, O., Tan, A., & Garcia, W. (2018). Engaging nursing students in the production of open educational resources. *Nurse Education Today*, 71, 75-77.

Wiley, D., Bliss, T., & McEwen, M. (2014). Open educational resources: A review of the literature. In *Handbook of Research on Educational Communications and Technology*: Fourth Edition (pp. 781-789). Springer New York.

Wilkins, E., & Wyche, C. J., (2019). *Clinical practice of the dental hygienist* (13th ed.). Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins.

Appendices

Appendix A

INSTRUMENT: SURVEY INFORMATION

Open Educational Resources Readiness Tool-Instrument in original form:

https://auspace.athabascau.ca/bitstream/handle/2149/3296/OER%20Readiness%20Tool-1.pdf?sequence=1&isAllowed=y

Modified Open Education Resources Readiness Tool

1) Please describe your position at your institution: Choose all that apply
   - □ Full time faculty
   - □ Part time faculty
   - □ Administrator (Chair, Dean, Director, Provost, etc.)

2) Please choose the role in which you teach or provide support.
   - □ Didactic only
   - □ Clinical only
   - □ Both

3) Please describe your institution/program: Choose all that apply
   - □ Bachelor's degree program
   - □ Associate's degree program
   - □ Community college
   - □ University
   - □ Other

4) How many years of experience do you have in an instructional role in dental hygiene education?
   - □ 1-5 years
   - □ 6-10 years
   - □ 11-15 years
   - □ 16-20 years
   - □ 20+ years

5) How many years of experience do you have in an instructional role in professional education *beyond* dental hygiene education?
   - □ 1-5 years
   - □ 6-10 years
   - □ 11-15 years
   - □ 16-20 years
   - □ 20+ years

6) How are course resources selected for the classes you teach or provide support to? Eg: textbooks, readings, multimedia selection
   - □ I select all of the course resources
   - □ The department chair or director chooses the course resources

- □ Selection of the course resources is shared with another instructor or colleague

7) How familiar are you with open educational resources (OERs)?
Definition: materials used to support education that may be freely accessed, reused, modified, and shared by anyone
   - o Not at all familiar
   - o Somewhat familiar
   - o Very familiar

8) Have you ever used OERs in your courses? Eg: Open access textbooks, multimedia, modules, lesson plans
   - o Yes
   - o No

9) Where did you find the OERs that you used?
Choose all that apply
   - □ Connections
   - □ Open Course Library
   - □ College Open Textbooks
   - □ Through a search tool
   - □ Other

10) In your previous use of OERs, how many course materials were open access?

	None of them	1 or 2	3 or 4	5 or more	All of them
Textbooks					
Supplementary Texts					
Other Course Materials					

11) In terms of quality of the materials, when you compare OERs with resources that are purchased, OERs are:
   - o Higher quality than commercial resources
   - o Similar in quality to commercial resources
   - o Lower quality than commercial resources

12) In terms of their value to course activities and student learning, when you compare your commercial resources to OERs, OERs are: (choose the appropriate response for each item)

	More valuable than commercial resources	Similar in value to commercial value	Less valuable than commercial resources
Textbooks			
Lessons			
Software programs			
Games			
Scholarly journal access			
Quizzes			
Audio			
Video			

Case studies			
Tutorials			

13) Compared to using commercial resources, did using OERs reduce costs for your students? (Choose the appropriate response for each item)

	Greatly reduces costs for students	Somewhat reduced costs for students	Little or no reduction in costs for students
Textbooks			
Lessons			
Software programs			
Games			
Scholarly journal access			
Quizzes			
Audio			
Video			
Case studies			
Tutorials			

14) Compared to using regular course materials, how easy was it to use OERs? (Choose the appropriate response for each item)

	Much easier to use than regular materials	About the same ease of use	More difficult to use than regular materials
Textbooks			
Lessons			
Software programs			
Games			
Scholarly journal access			
Quizzes			
Audio			
Video			
Case studies			
Tutorials			

15) Considering your own classes, how likely are you to use OERs? Definition: Textbooks, lessons, software, scholarly journal access, games, quizzes, audio, video, case studies, tutorials
    - Very likely
    - Somewhat likely
    - Not at all likely

16) Considering you own courses, how likely are you to <u>create</u> the following OERs? (Chose the appropriate response to each item)

	Very likely	Somewhat likely	Not at all likely
Textbooks			
Lessons			
Software programs			
Games			
Scholarly journal access			

Quizzes			
Audio			
Video			
Case studies			
Tutorials			

17) How important are the factors below in influencing your decision to use OERs? (Chose the appropriate response to each item)

	Very important	Somewhat important	Not at all important
Knowledge about OERs			
Time to find, review, and select OERs			
Academic quality of materials			
Availability of a course team with expertise in design, support, and implementation of OER			
Recognition in efforts towards innovation			
Support from administration			
Hardware or software to facilitate use			
Desire to reduce costs for students			
Environmental concerns (conserving paper)			

18) If there was a factor not listed above, please describe:

19) Given the choice, which would you prefer?
- To use OERs
- To adapt OERs
- To create OERs

Explain why:

20) How important are the factors below in influencing your decision to create OERs? (Choose the appropriate response to each item)

	Very important	Somewhat important	Not at all important
Knowledge about OERs			
Time to find, review, and select OERs			
Academic quality of materials			
Availability of a course team with expertise in design, support, and implementation of OER			
Recognition in efforts towards innovation			
Support from administration			

Hardware or software to facilitate use			
Desire to reduce costs for students			
Environmental concerns (conserving paper)			

21) If there was another factor not listed above, please describe:
22) Have you created, or are you now creating any of the following for open access? (Choose all that apply)
- □ Textbooks
- □ Lessons
- □ Software
- □ Games
- □ Quizzes
- □ Audio
- □ Video
- □ Case studies
- □ Tutorials
- □ Other

23) In which of the following would you be interested in participating to learn more about these topics? (Choose the appropriate response to each item)

	Attend face to face workshop	Attend online workshop	Receive information via email	Access information through a website or join a group
Guidelines to find OERs				
Open access textbooks				
Guidelines for authoring open access textbooks				
Peer reviews of open access texts, guidelines, and process				
Copyright and intellectual property related to OERs				
Work with a team to develop OERs				
Promoting recognition of open access efforts				
How to license OERs appropriately				

Appendix B

Copy of the IRB approval document which was received on October 5, 2020.

IRB Approval

2201071

GEORGE FOX UNIVERSITY HSRC INITIAL REVIEW QUESTIONNAIRE **Page** 7

Title: An Exploration of Open Education Resources and Dental Hygiene Education: A Quantitative Study

Principal Researcher(s): Jessica Luebbers and Dane Joseph, PhD

Date application completed: 9/27/2020

(The researcher needs to complete the above information on this page)

COMMITTEE FINDING: For Committee Use Only

☒ (1) The proposed research makes adequate provision for safeguarding the health and dignity of the subjects and is therefore approved.

☐ (2) Due to the assessment of risk being questionable or being subject to change, the research must be periodically reviewed by the **HSRC** on a basis throughout the course of the research or until otherwise notified. This requires resubmission of this form, with updated information, for each periodic review.

☐ (3) The proposed research evidences some unnecessary risk to participants and therefore must be revised to remedy the following specific area(s) on non-compliance:

☐ (4) The proposed research contains serious and potentially damaging risks to subjects and is therefore not approved.

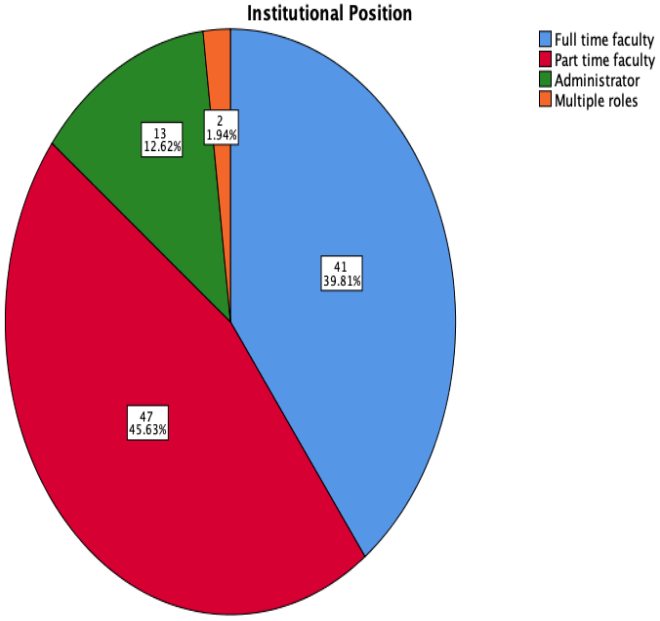
Chair or designated member

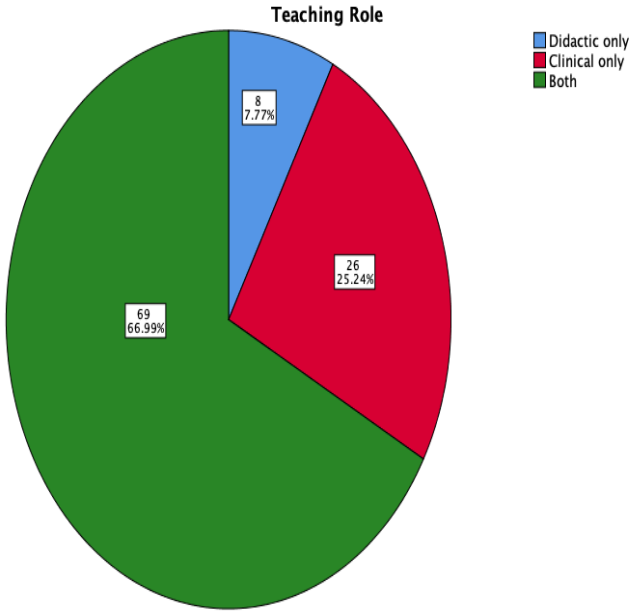
10-5-20

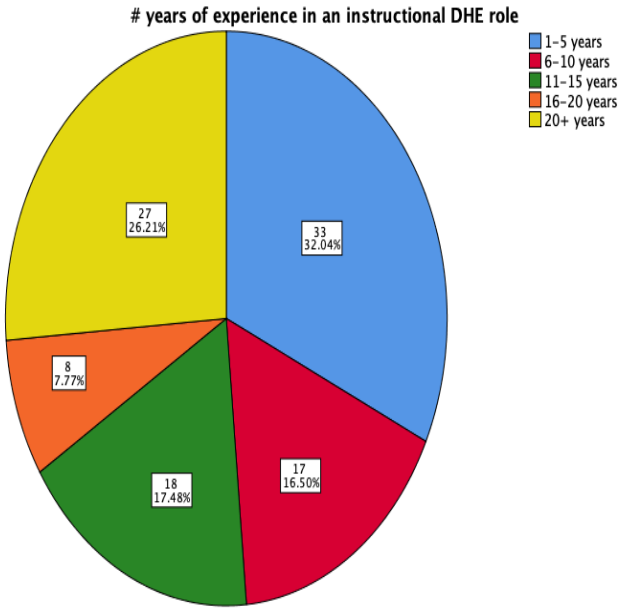
Date

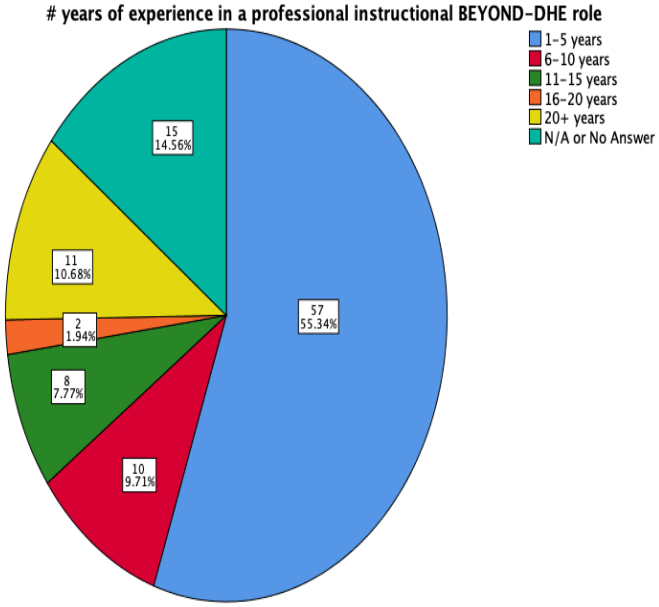
Appendix C

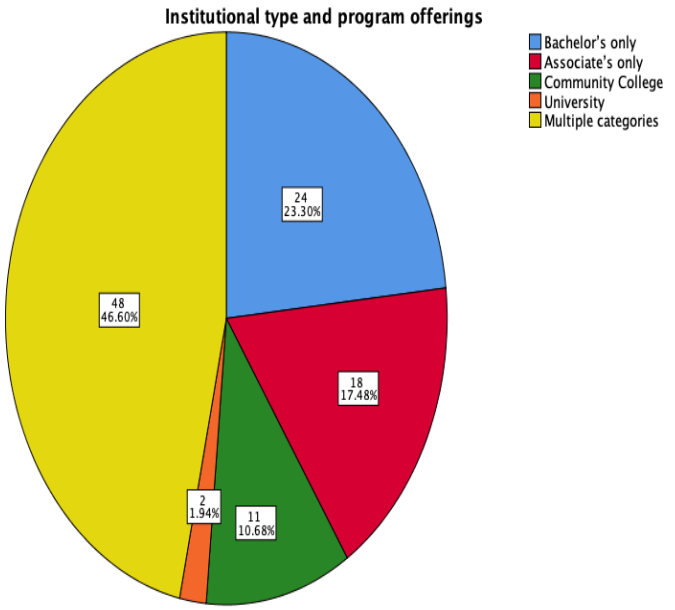
The following data is a compilation of pie charts from the study.

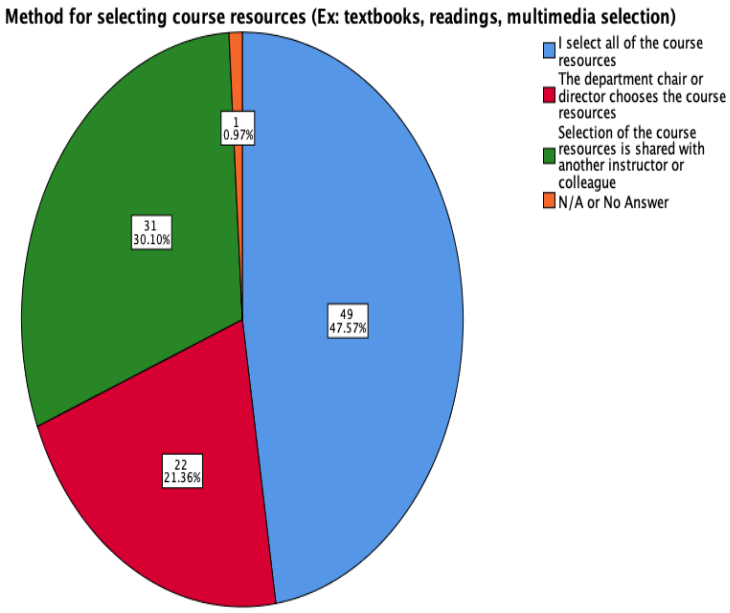


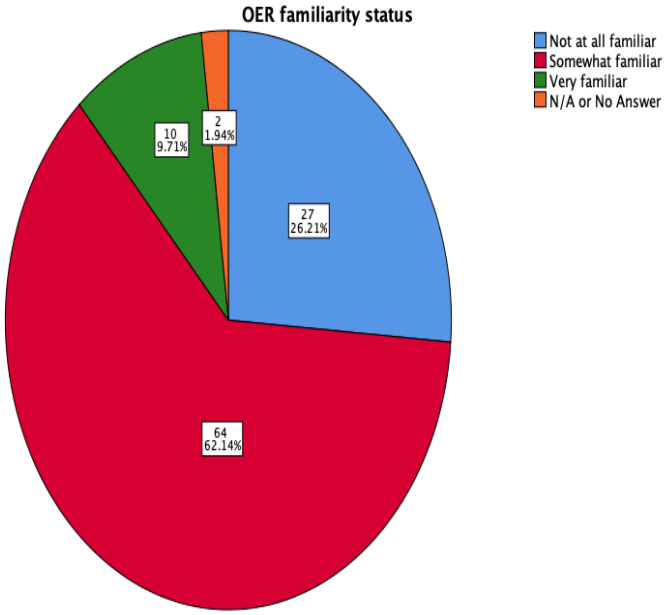


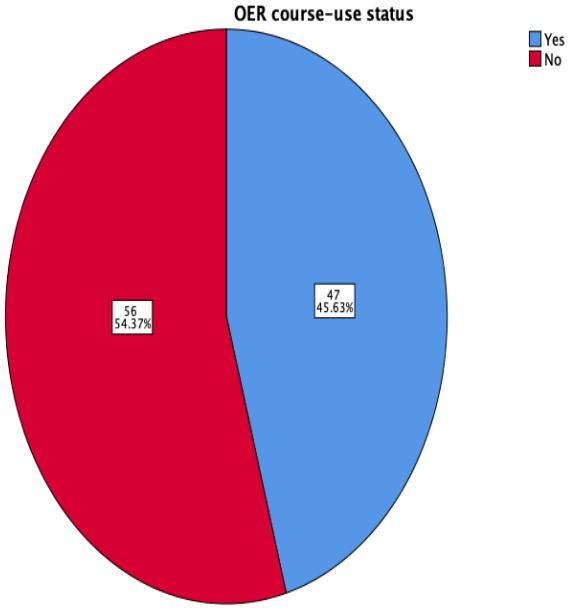

years of experience in an instructional DHE role
1-5 years
6-10 years
11-15 years
16-20 years
20+ years
33
32.04%
17
16.50%
18
17.48%
8
7.77%
27
26.21%

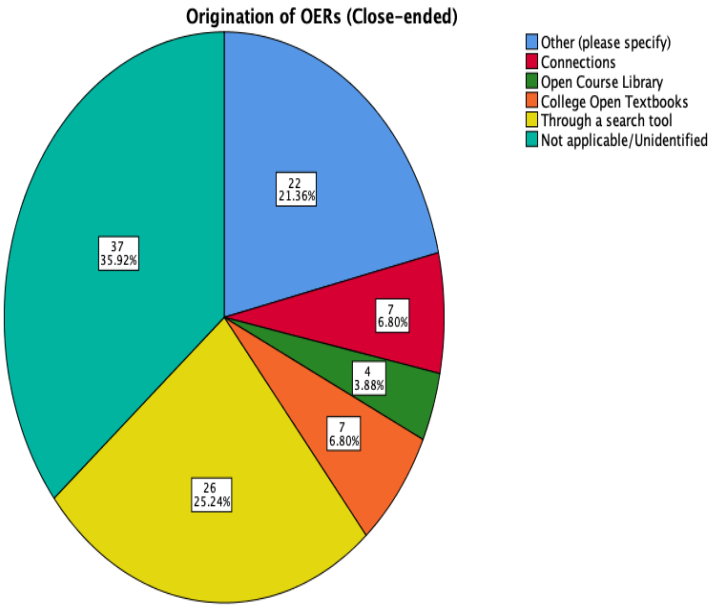

years of experience in a professional instructional BEYOND-DHE role
1-5 years
6-10 years
11-15 years
16-20 years
20+ years
N/A or No Answer
57
55.34%
10
9.71%
8
7.77%
2
1.94%
11
10.68%
15
14.56%

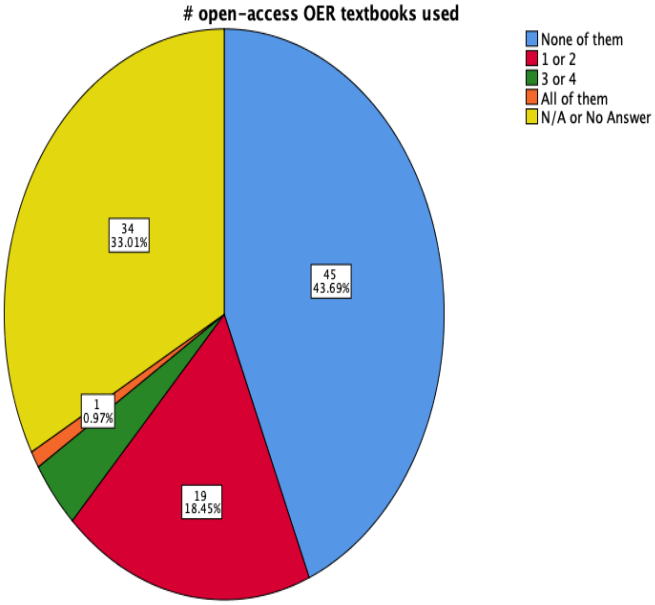

Institutional type and program offerings
Bachelor's only
Associate's only
Community College
University
Multiple categories
24
23.30%
18
17.48%
11
10.68%
2
1.94%
48
46.60%

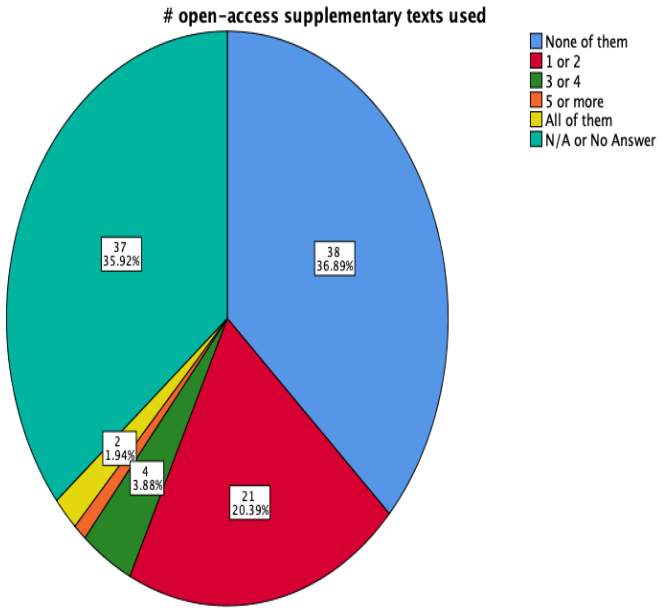

Method for selecting course resources (Ex: textbooks, readings, multimedia selection)
I select all of the course resources
The department chair or director chooses the course resources
Selection of the course resources is shared with another instructor or colleague
N/A or No Answer
1
0.97%
31
30.10%
49
47.57%
22
21.36%

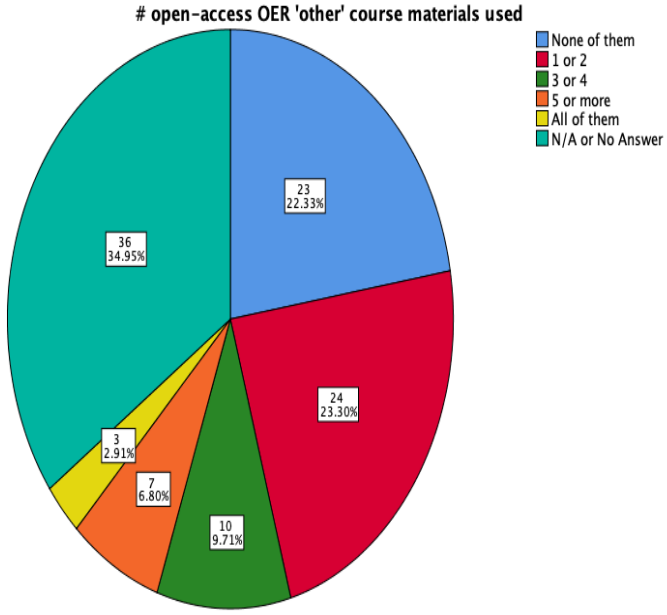

OER familiarity status
Not at all familiar
Somewhat familiar
Very familiar
N/A or No Answer
27
26.21%
64
62.14%
10
9.71%
2
1.94%

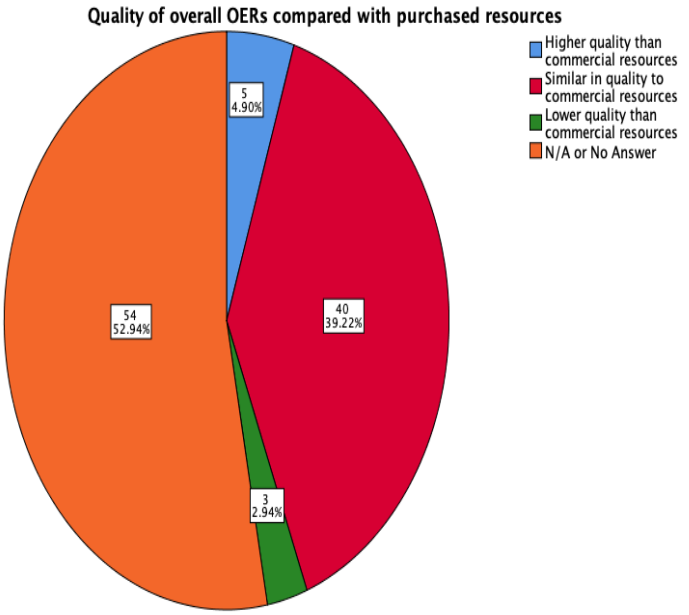

OER course-use status
Yes
No
47
45.63%
56
54.37%

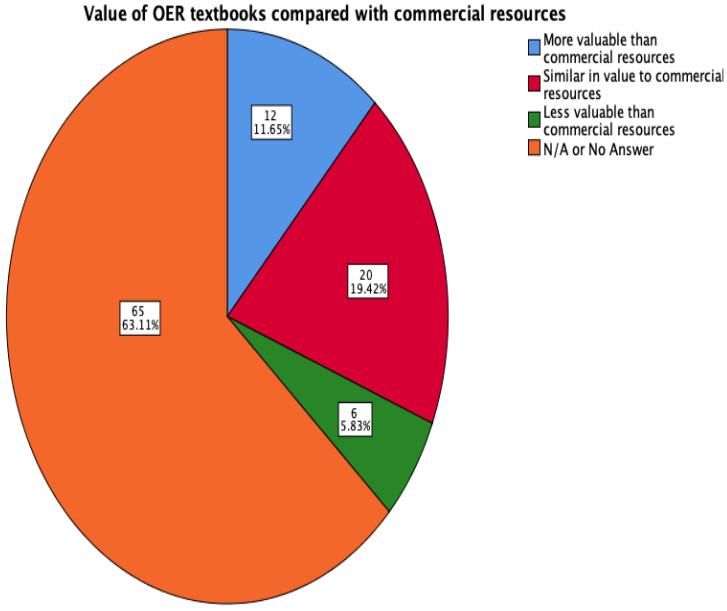

Origination of OERs (Close-ended)
Other (please specify)
Connections
Open Course Library
College Open Textbooks
Through a search tool
Not applicable/Unidentified
22
21.36%
7
6.80%
4
3.88%
7
6.80%
26
25.24%
37
35.92%

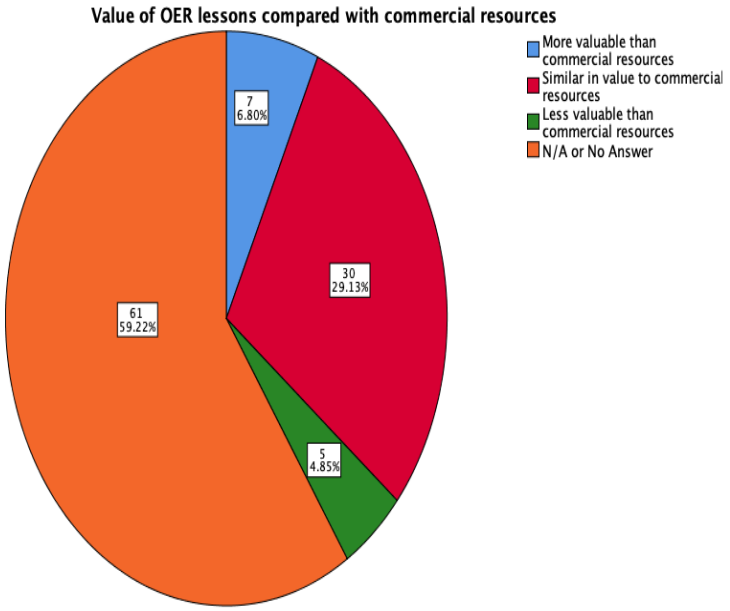

open-access OER textbooks used
None of them
1 or 2
3 or 4
All of them
N/A or No Answer
45
43.69%
19
18.45%
1
0.97%
34
33.01%

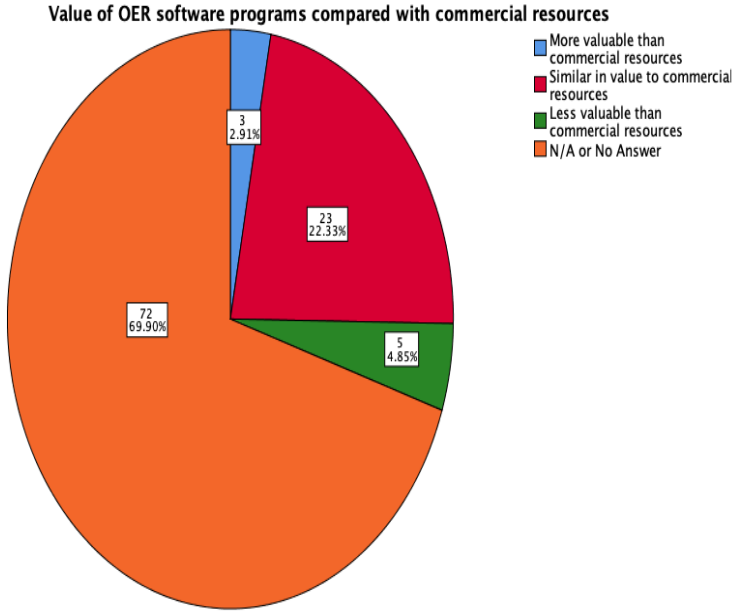

open-access supplementary texts used
None of them
1 or 2
3 or 4
5 or more
All of them
N/A or No Answer
38
36.89%
21
20.39%
4
3.88%
2
1.94%
37
35.92%

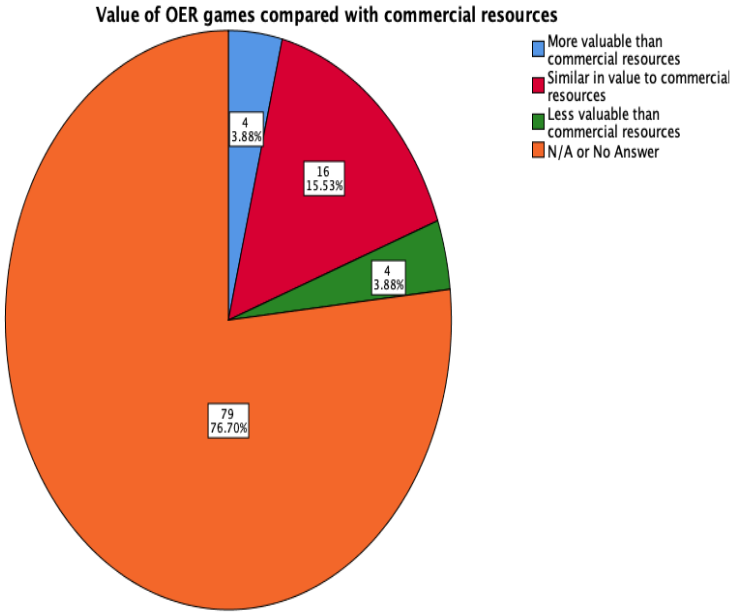

open-access OER 'other' course materials used
None of them
1 or 2
3 or 4
5 or more
All of them
N/A or No Answer
23
22.33%
24
23.30%
10
9.71%
7
6.80%
3
2.91%
36
34.95%

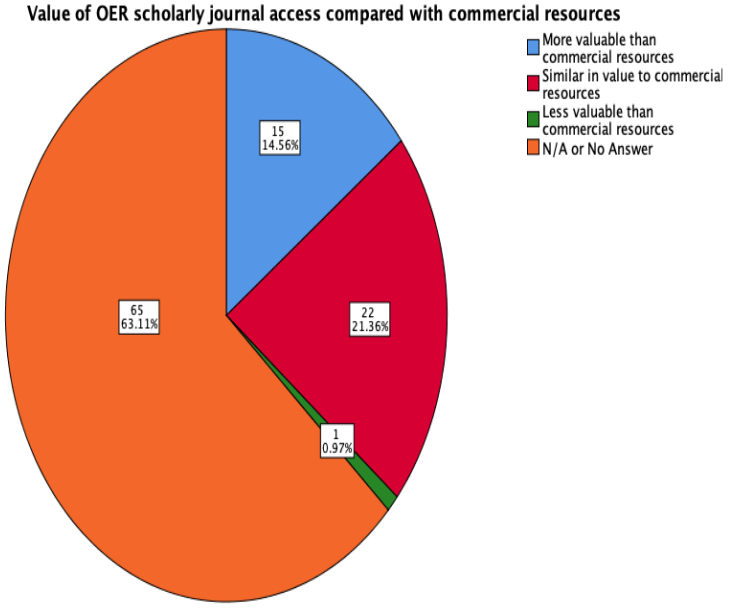

Quality of overall OERs compared with purchased resources
Higher quality than commercial resources
Similar in quality to commercial resources
Lower quality than commercial resources
N/A or No Answer
5
4.90%
40
39.22%
3
2.94%
54
52.94%

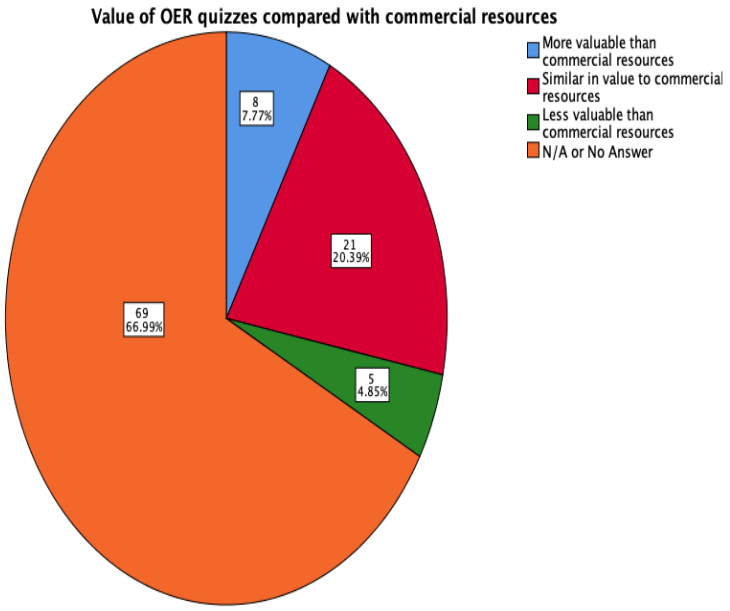

Value of OER textbooks compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
12
11.65%
20
19.42%
6
5.83%
65
63.11%

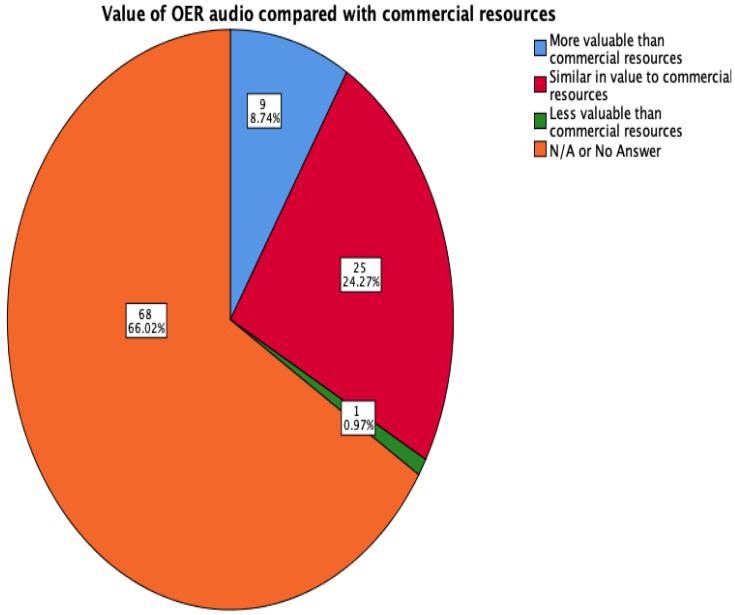

Value of OER lessons compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
7
6.80%
30
29.13%
5
4.85%
61
59.22%

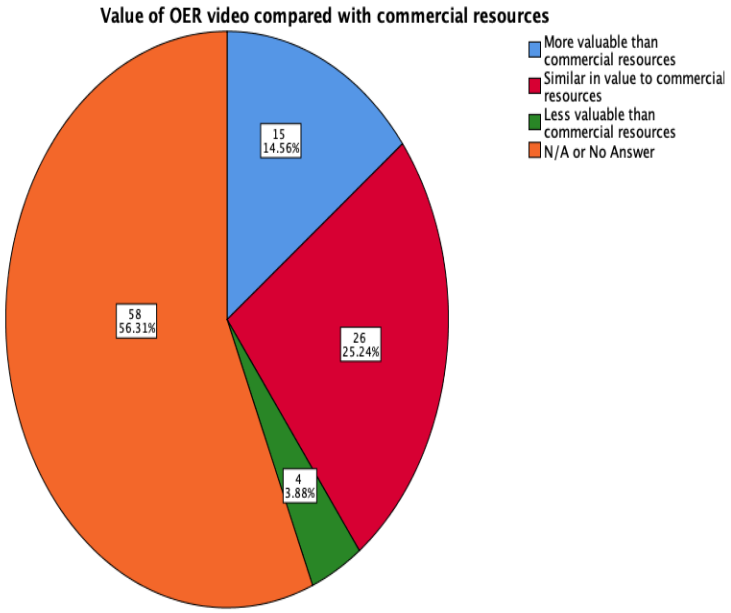

Value of OER software programs compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
3
2.91%
23
22.33%
5
4.85%
72
69.90%

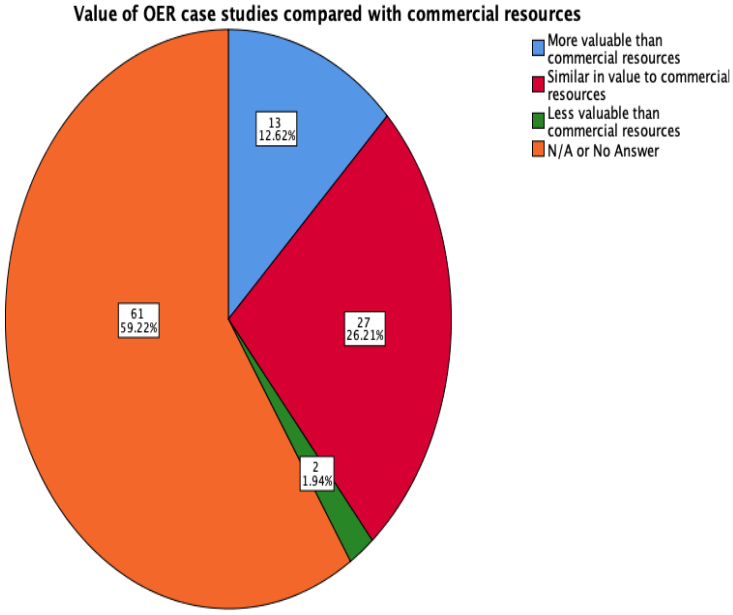

Value of OER games compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
4
3.88%
16
15.53%
4
3.88%
79
76.70%

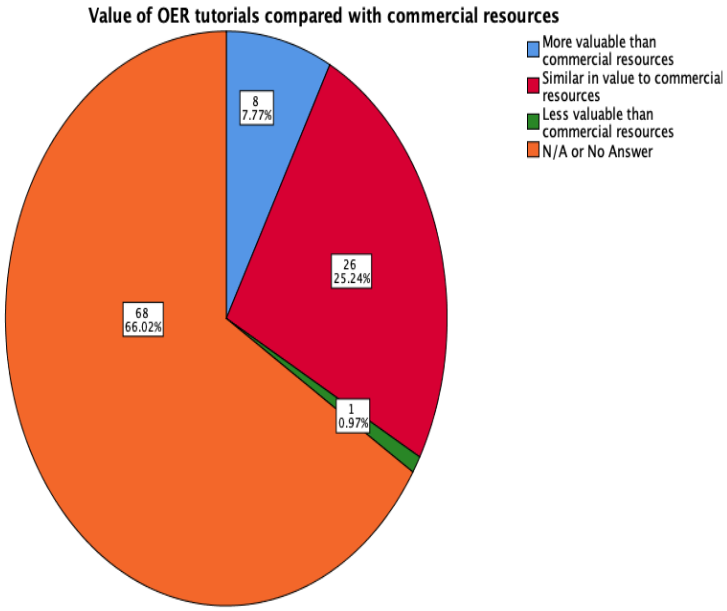

Value of OER scholarly journal access compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
15
14.56%
22
21.36%
1
0.97%
65
63.11%

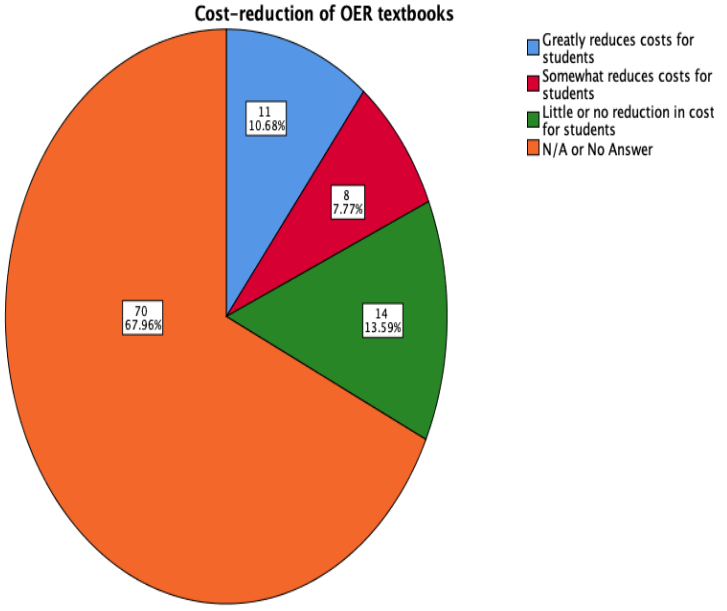

Value of OER quizzes compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
8
7.77%
21
20.39%
5
4.85%
69
66.99%

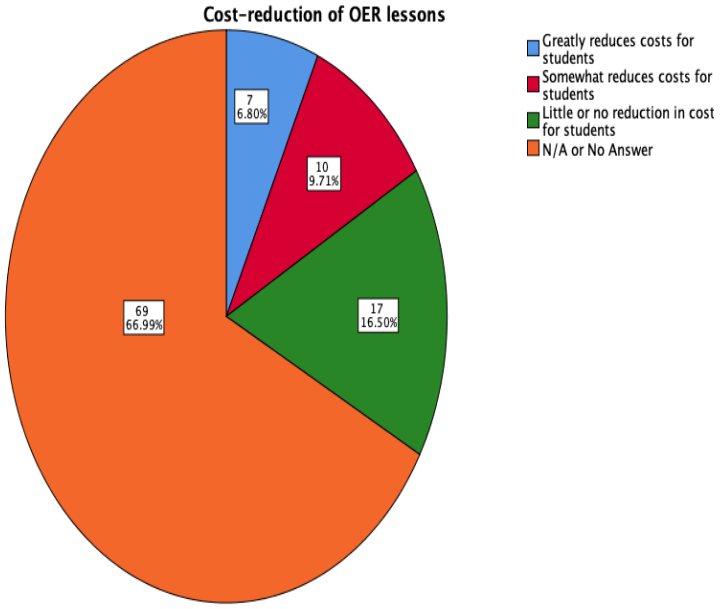

Value of OER audio compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
9
8.74%
25
24.27%
1
0.97%
68
66.02%

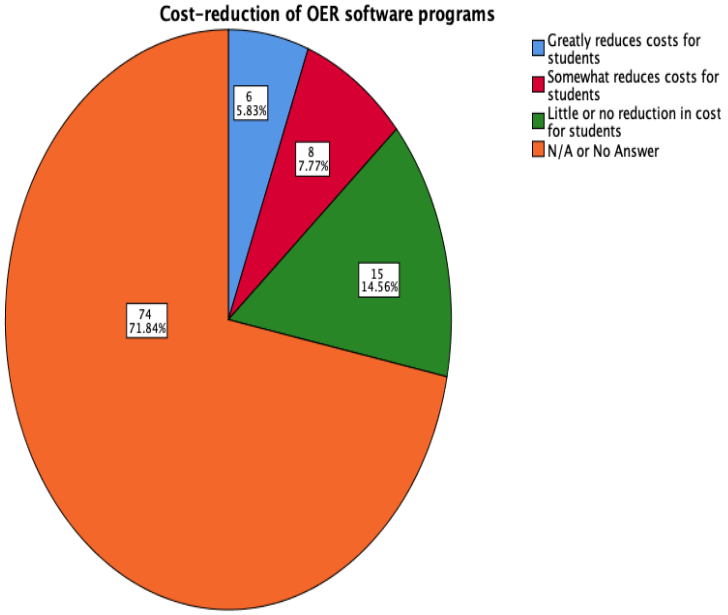

Value of OER video compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
15
14.56%
26
25.24%
4
3.88%
58
56.31%

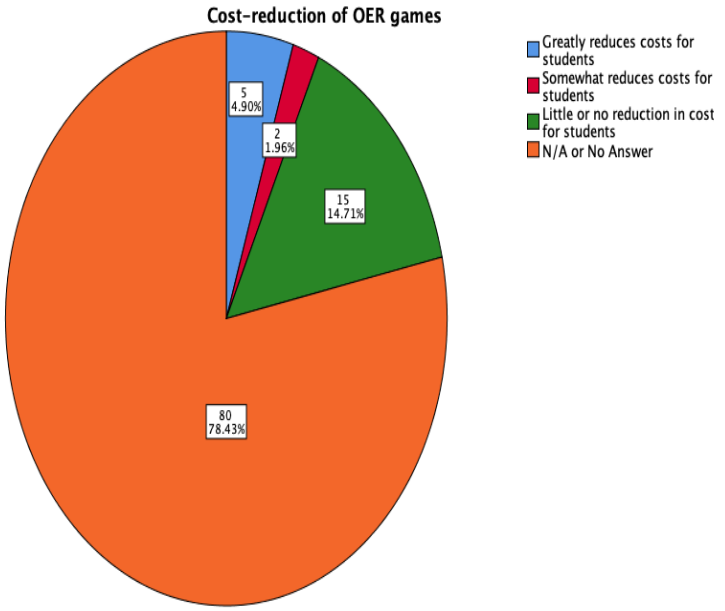

Value of OER case studies compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
13
12.62%
27
26.21%
2
1.94%
61
59.22%

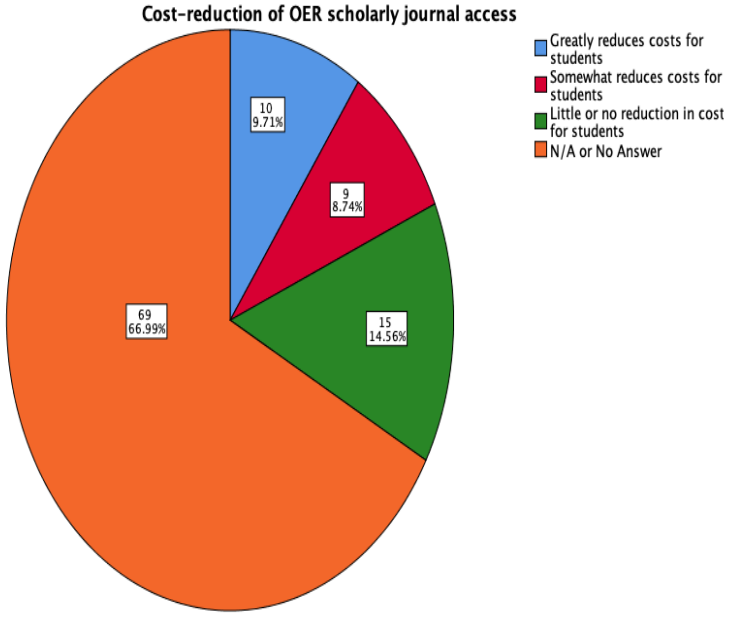

Value of OER tutorials compared with commercial resources
More valuable than commercial resources
Similar in value to commercial resources
Less valuable than commercial resources
N/A or No Answer
8
7.77%
26
25.24%
1
0.97%
68
66.02%

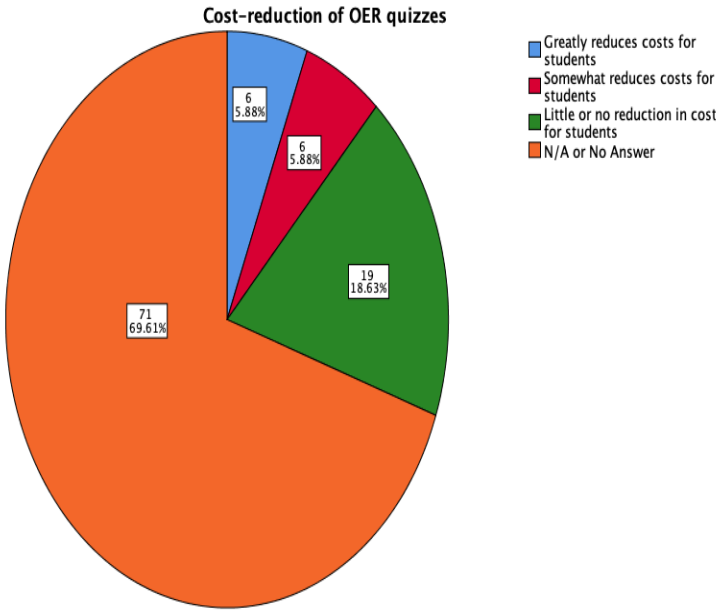

Cost-reduction of OER textbooks
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer
11
10.68%
8
7.77%
14
13.59%
70
67.96%

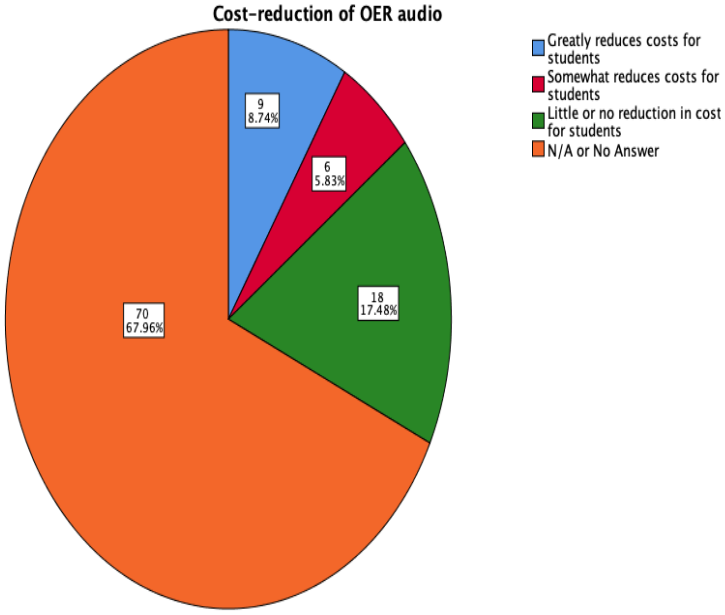

Cost-reduction of OER lessons
7
6.80%
10
9.71%
17
16.50%
69
66.99%
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer

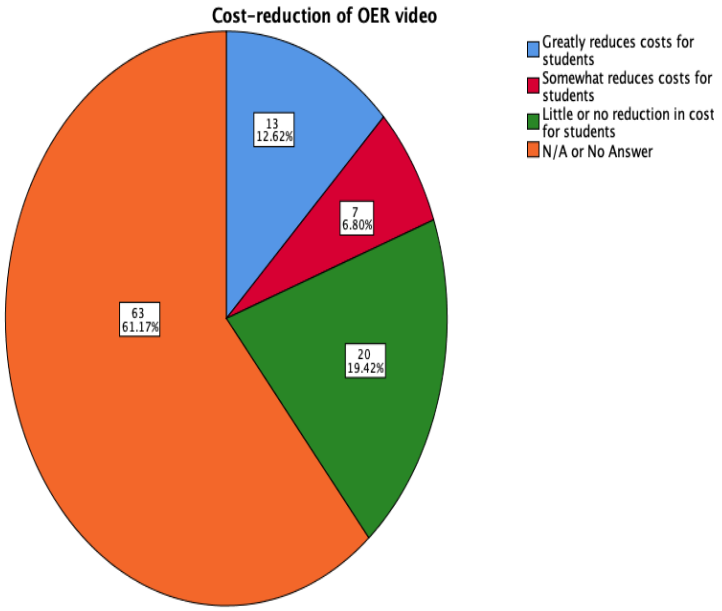

Cost-reduction of OER software programs
6
5.83%
8
7.77%
15
14.56%
74
71.84%
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer

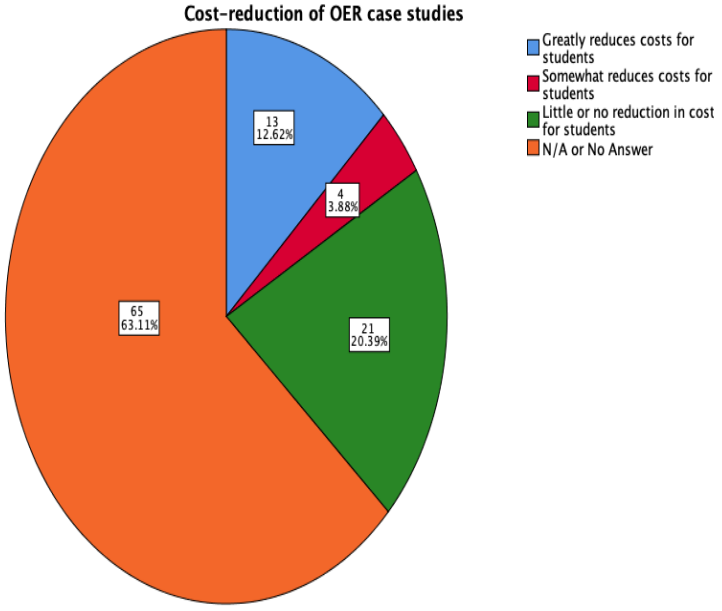

Cost-reduction of OER games
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer
5
4.90%
2
1.96%
15
14.71%
80
78.43%

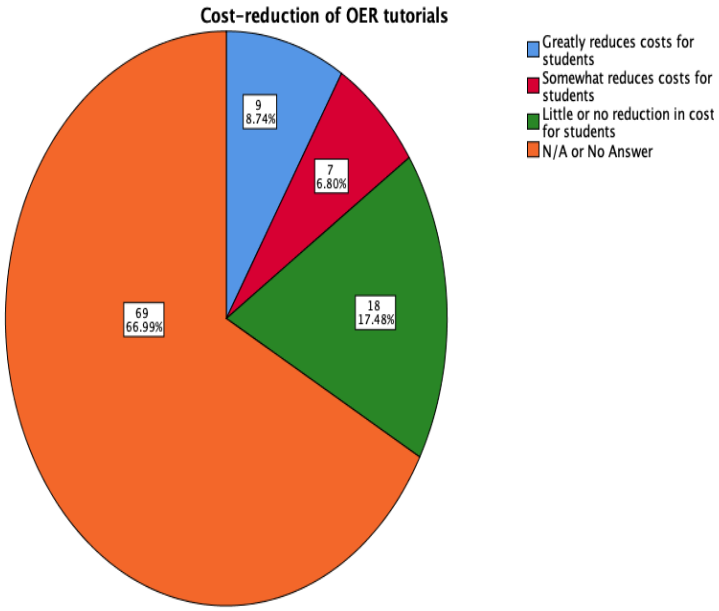

Cost-reduction of OER scholarly journal access
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer
10
9.71%
9
8.74%
15
14.56%
69
66.99%

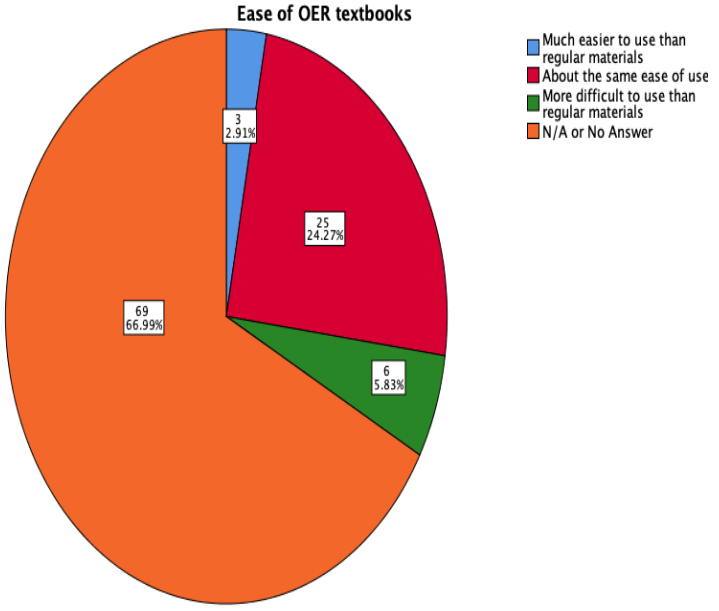

Cost-reduction of OER quizzes
6
5.88%
6
5.88%
19
18.63%
71
69.61%
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer

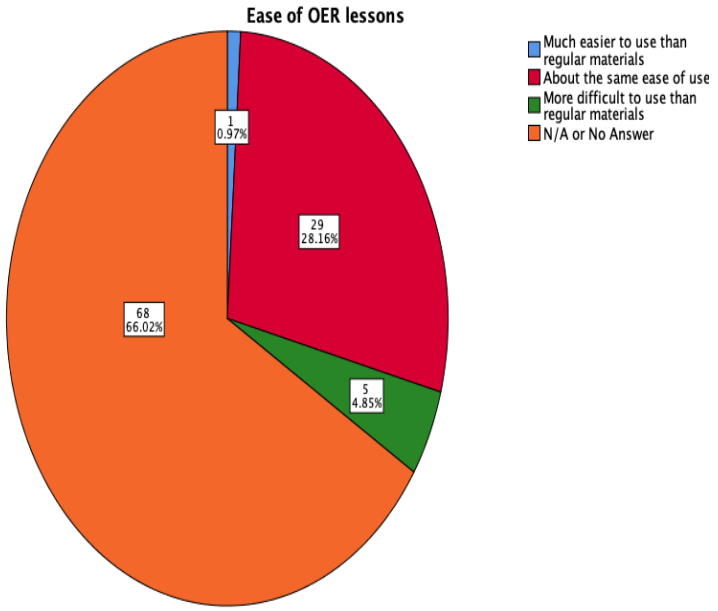

Cost-reduction of OER audio
9
8.74%
6
5.83%
18
17.48%
70
67.96%
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer

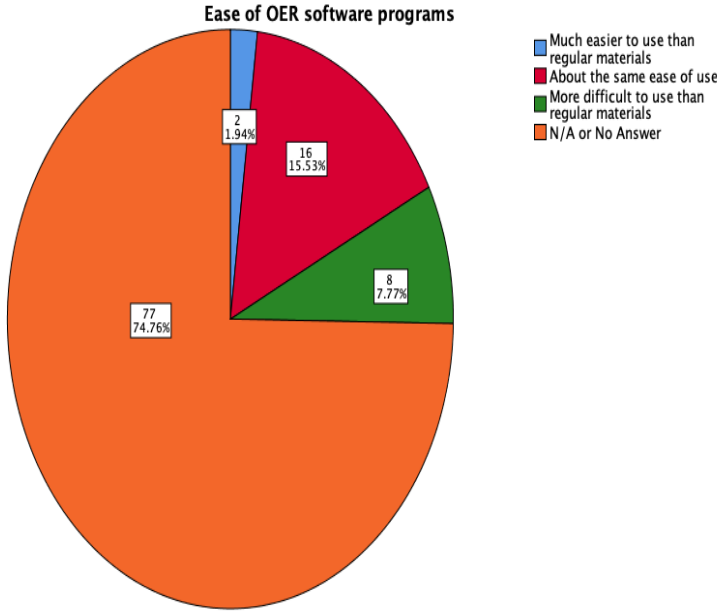

Cost-reduction of OER video
13
12.62%
7
6.80%
20
19.42%
63
61.17%
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer

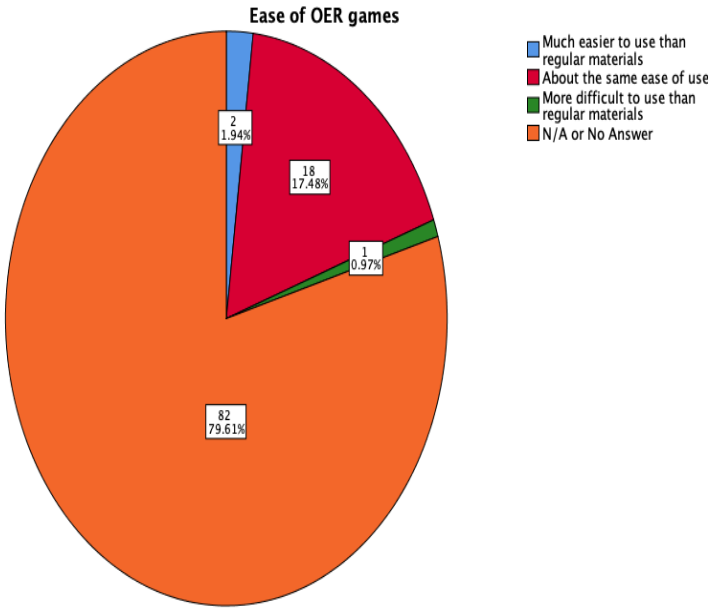

Cost-reduction of OER case studies
13
12.62%
4
3.88%
21
20.39%
65
63.11%
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer

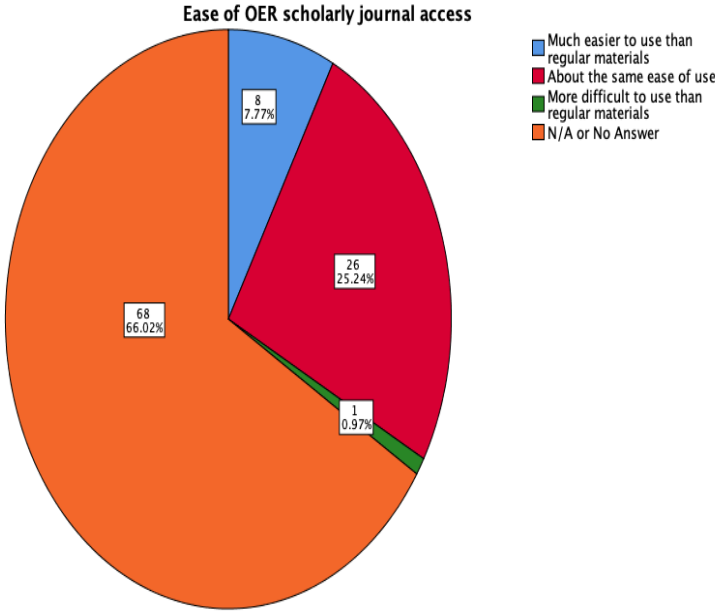

Cost-reduction of OER tutorials
Greatly reduces costs for students
Somewhat reduces costs for students
Little or no reduction in cost for students
N/A or No Answer
9
8.74%
7
6.80%
18
17.48%
69
66.99%

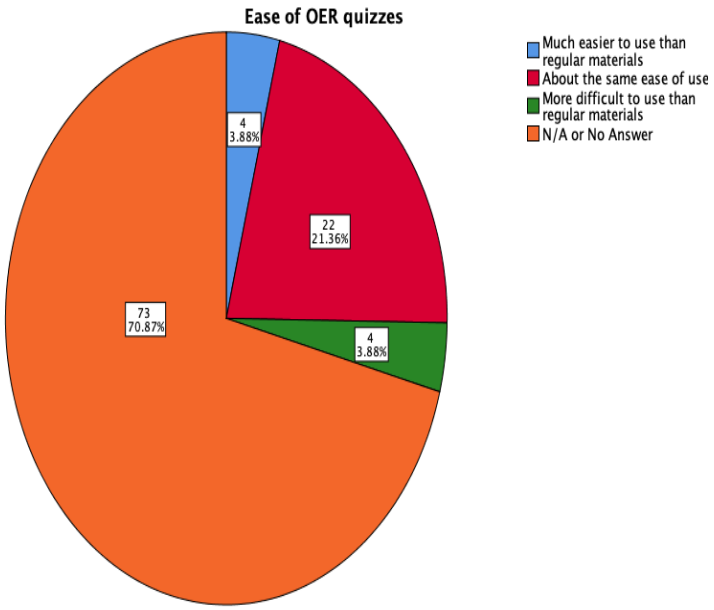

Ease of OER textbooks
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
3
2.91%
25
24.27%
6
5.83%
69
66.99%

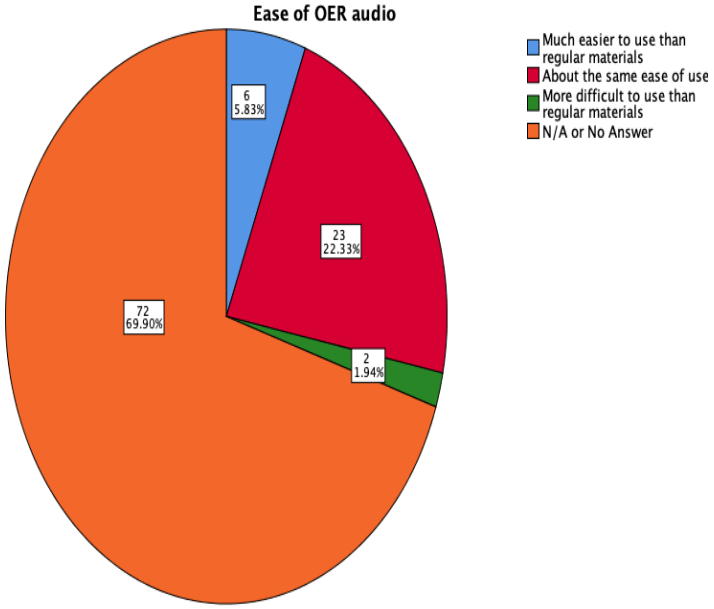

Ease of OER lessons
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
1
0.97%
29
28.16%
68
66.02%
5
4.85%

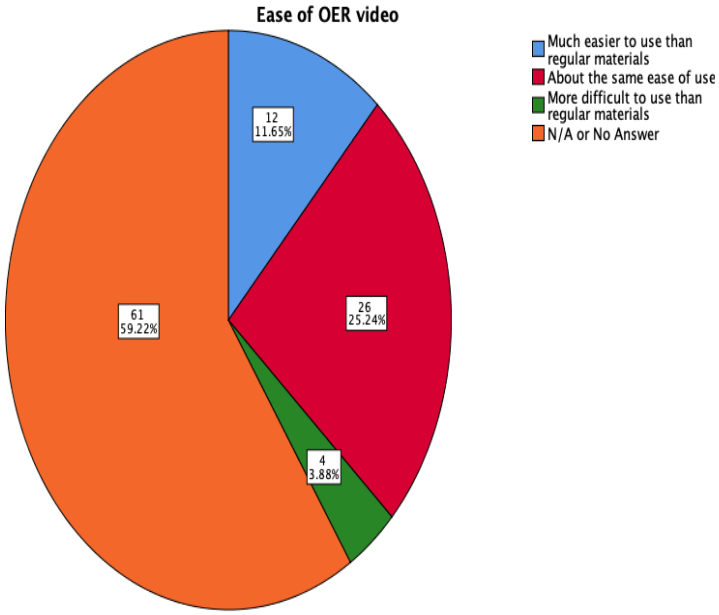

Ease of OER software programs
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
2
1.94%
16
15.53%
8
7.77%
77
74.76%

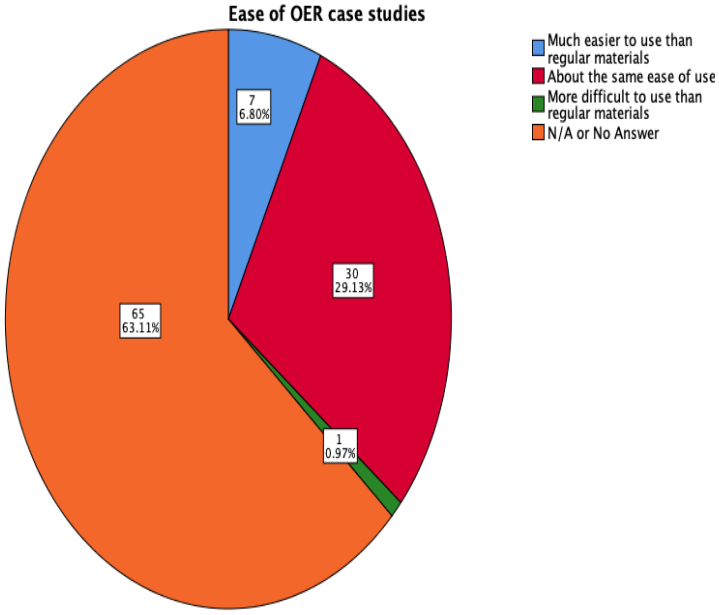

Ease of OER games
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
2
1.94%
18
17.48%
1
0.97%
82
79.61%

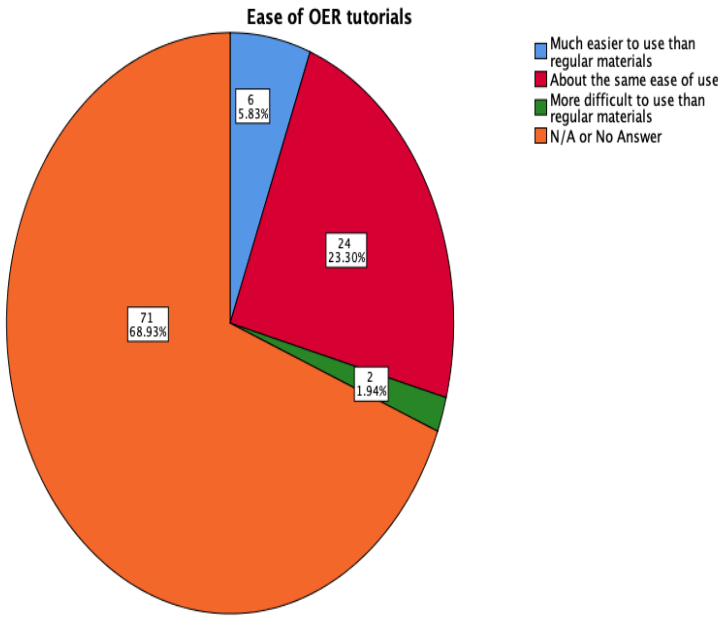

Ease of OER scholarly journal access
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
8
7.77%
26
25.24%
68
66.02%
1
0.97%

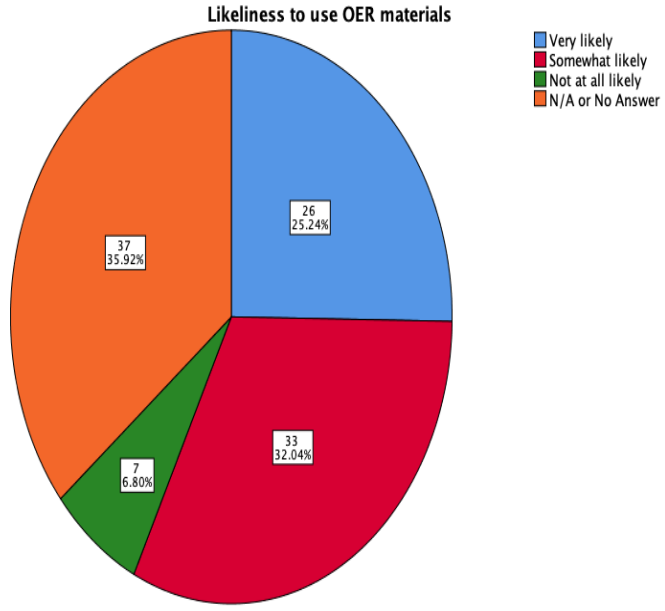

Ease of OER quizzes
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
4
3.88%
22
21.36%
4
3.88%
73
70.87%

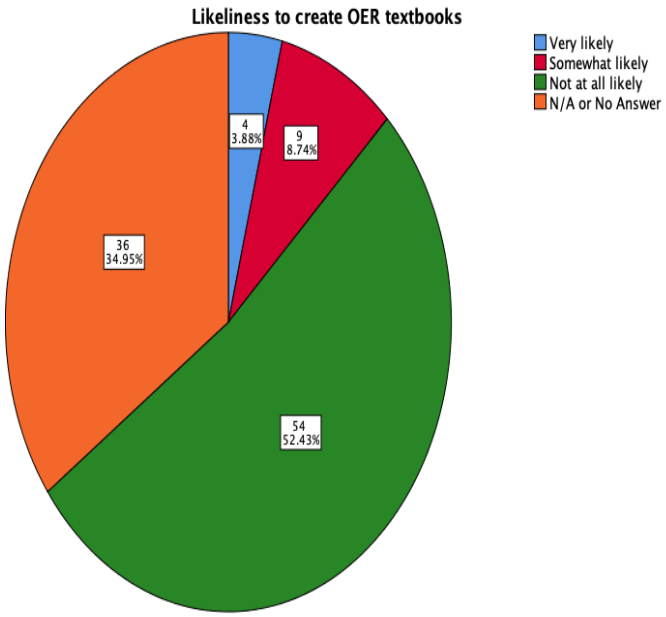

Ease of OER audio
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
6
5.83%
23
22.33%
2
1.94%
72
69.90%

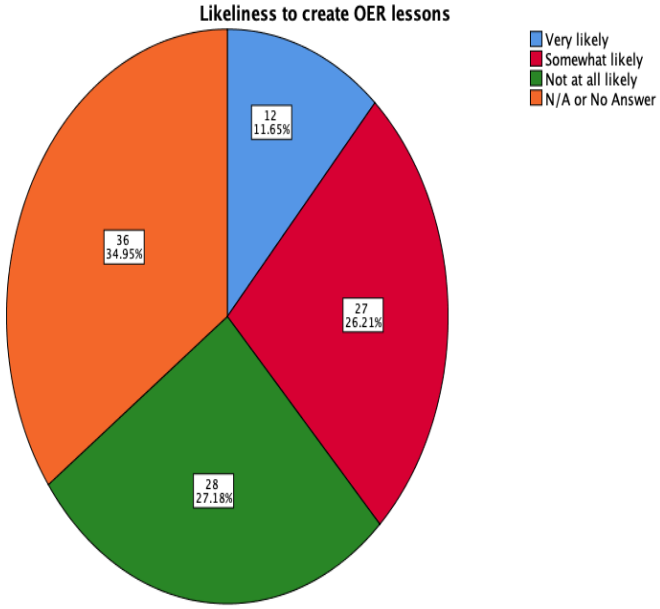

Ease of OER video
12
11.65%
26
25.24%
4
3.88%
61
59.22%
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer

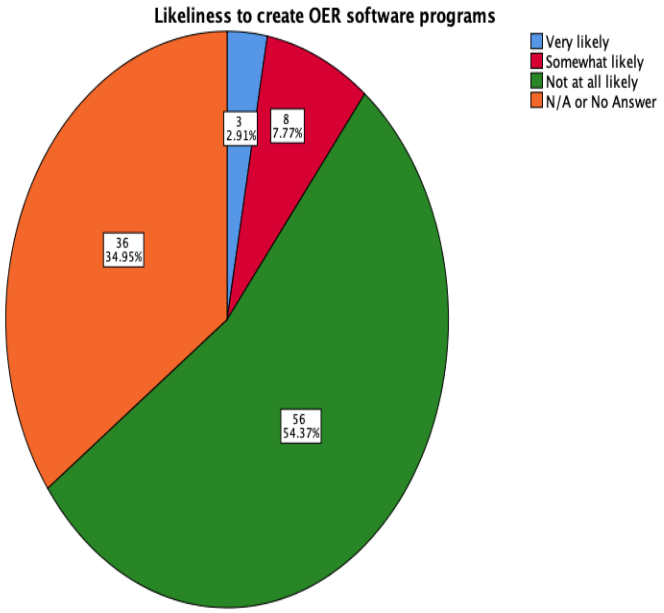

Ease of OER case studies
7
6.80%
30
29.13%
1
0.97%
65
63.11%
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer

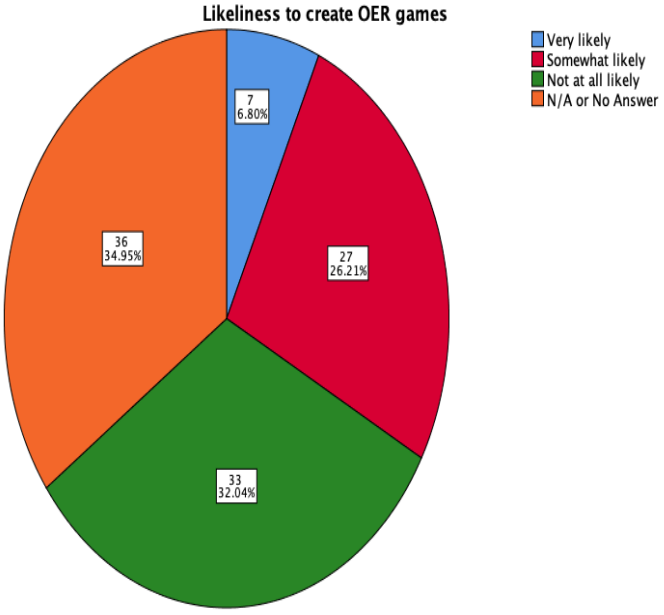

Ease of OER tutorials
Much easier to use than regular materials
About the same ease of use
More difficult to use than regular materials
N/A or No Answer
6
5.83%
24
23.30%
2
1.94%
71
68.93%

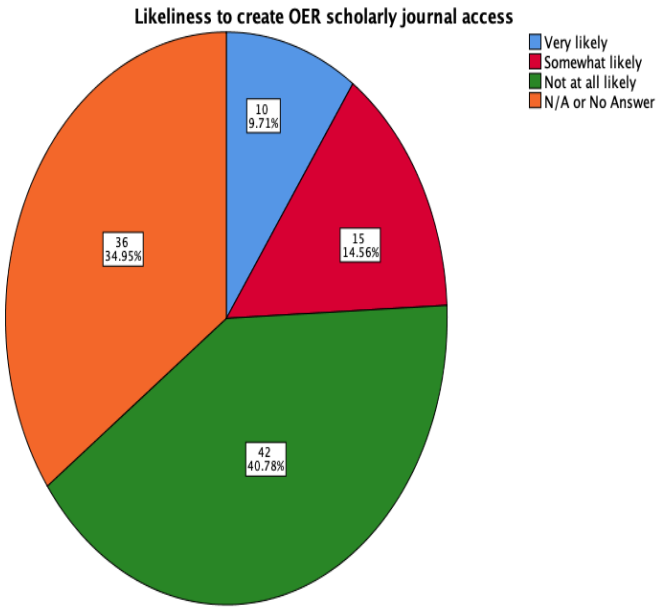

Likeliness to use OER materials
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
26
25.24%
33
32.04%
7
6.80%
37
35.92%

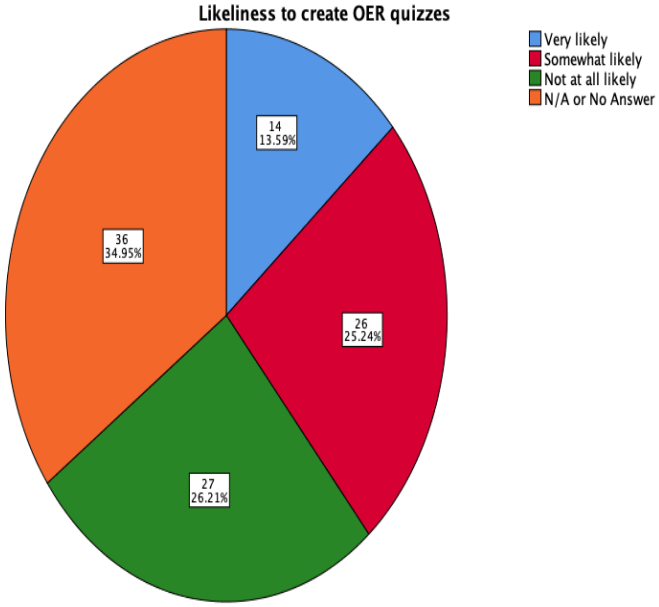

Likeliness to create OER textbooks
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
4
3.88%
9
8.74%
36
34.95%
54
52.43%

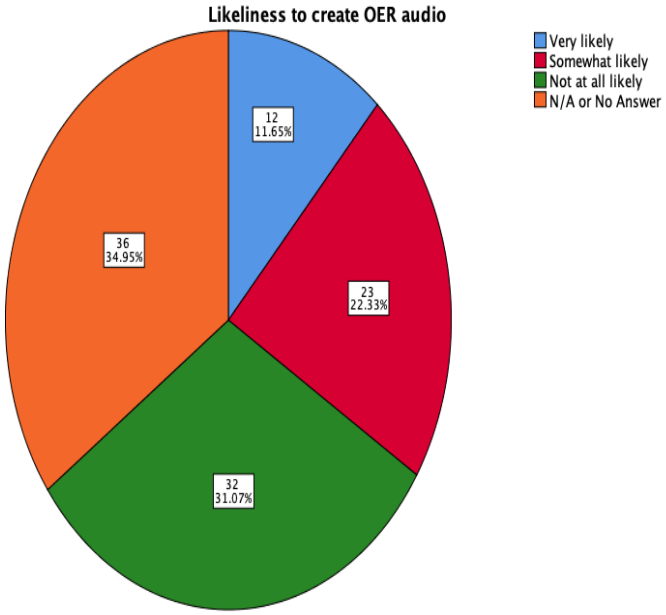

Likeliness to create OER lessons
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
12
11.65%
36
34.95%
27
26.21%
28
27.18%

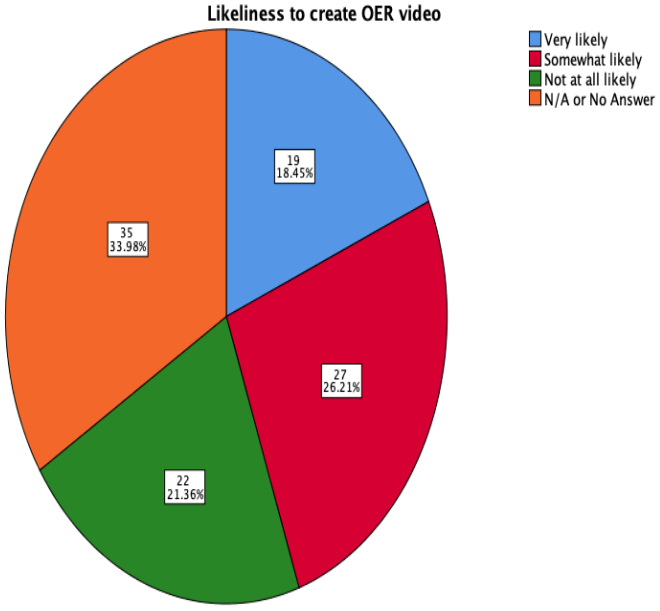

Likeliness to create OER software programs
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
3
2.91%
8
7.77%
36
34.95%
56
54.37%

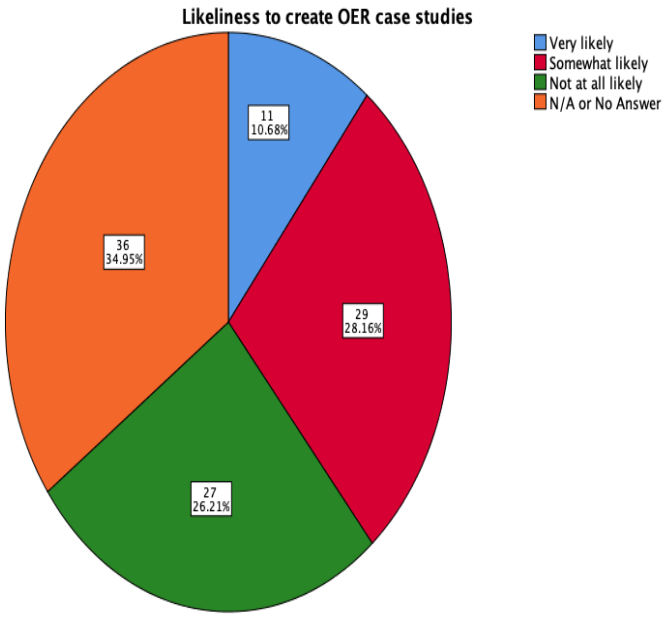

Likeliness to create OER games
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
7
6.80%
27
26.21%
36
34.95%
33
32.04%

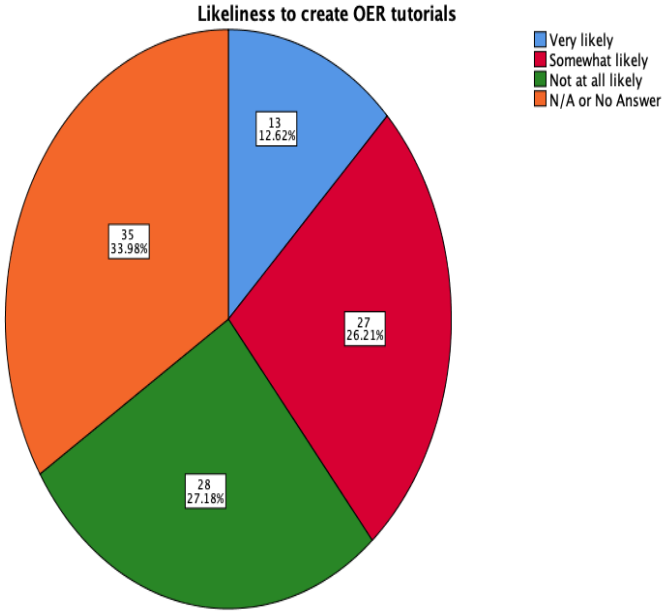

Likeliness to create OER scholarly journal access
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
10
9.71%
15
14.56%
42
40.78%
36
34.95%

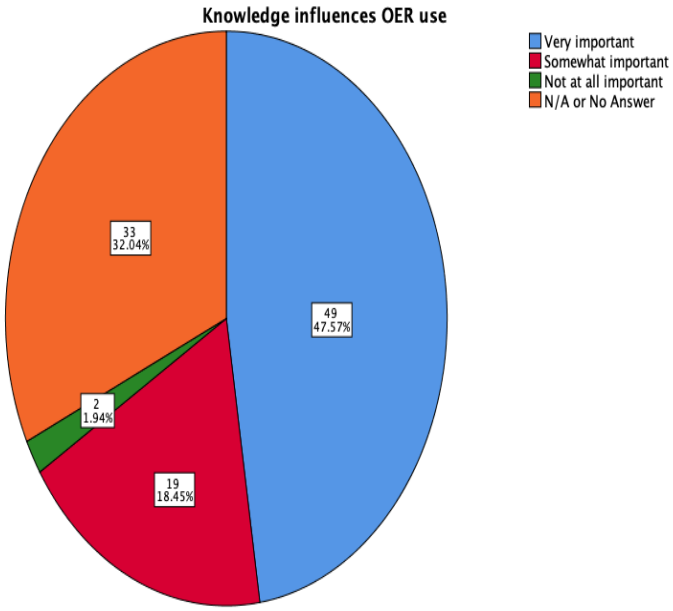

Likeliness to create OER quizzes
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
14
13.59%
26
25.24%
27
26.21%
36
34.95%

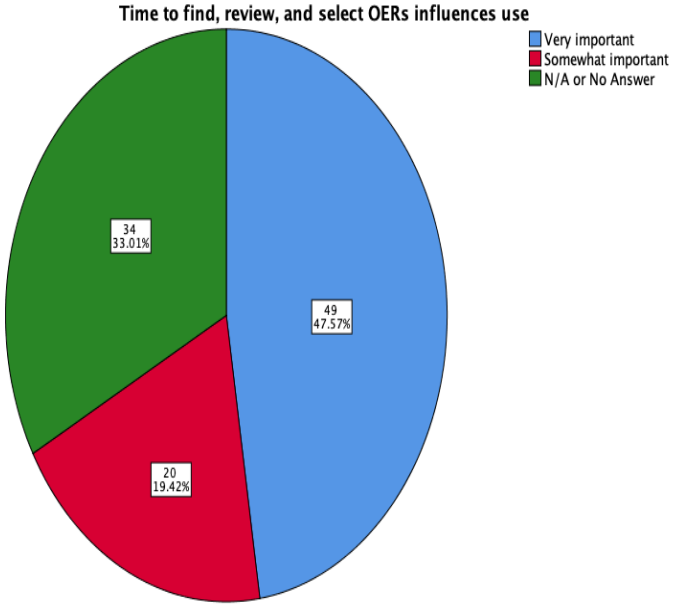

Likeliness to create OER audio
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
12
11.65%
23
22.33%
32
31.07%
36
34.95%

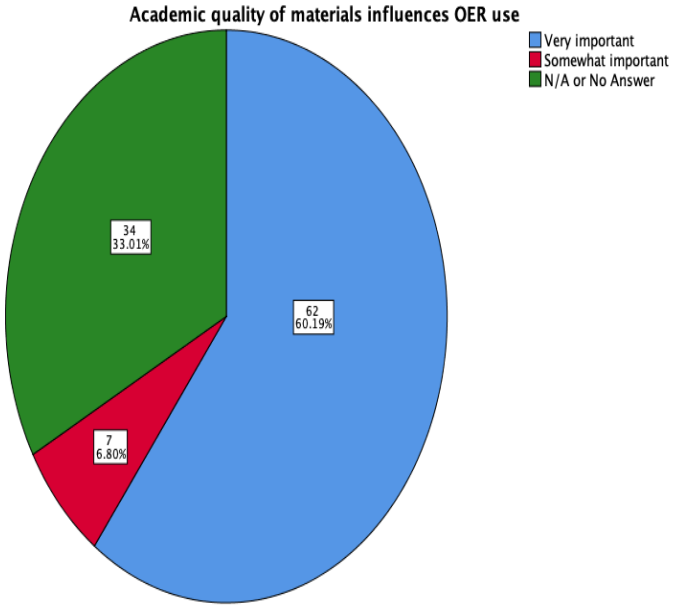

Likeliness to create OER video
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
19
18.45%
27
26.21%
22
21.36%
35
33.98%

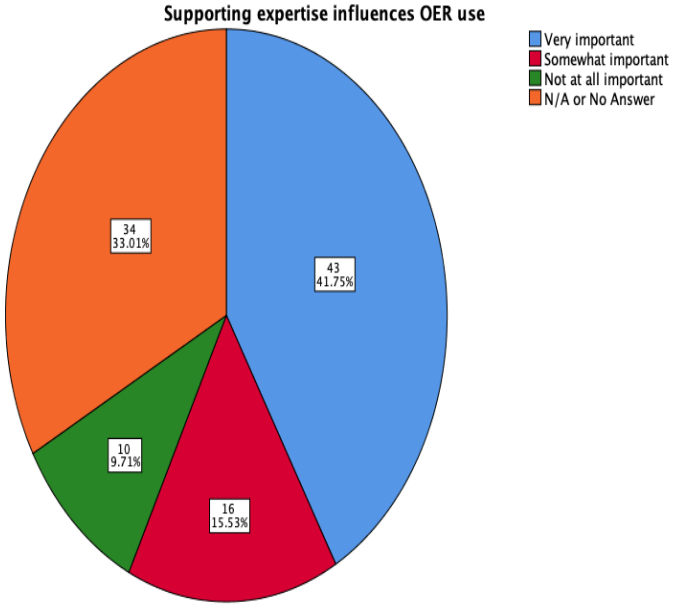

Likeliness to create OER case studies
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
11
10.68%
29
28.16%
27
26.21%
36
34.95%

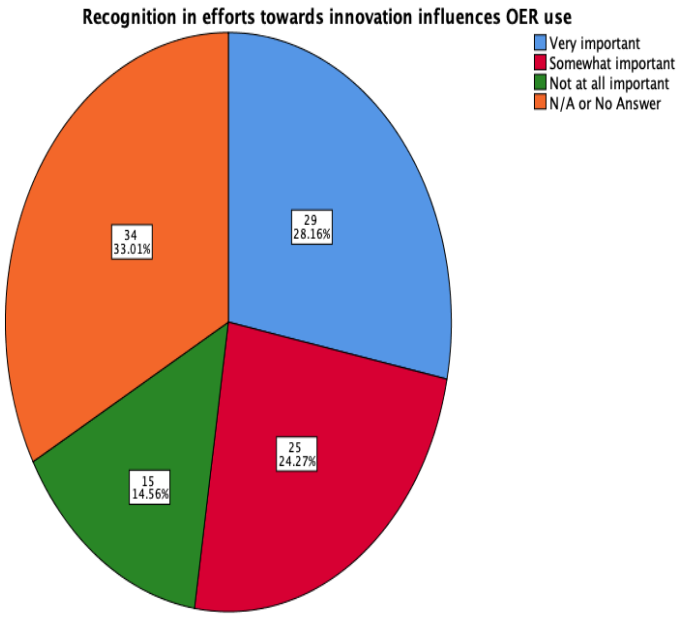

Likeliness to create OER tutorials
Very likely
Somewhat likely
Not at all likely
N/A or No Answer
13
12.62%
27
26.21%
28
27.18%
35
33.98%

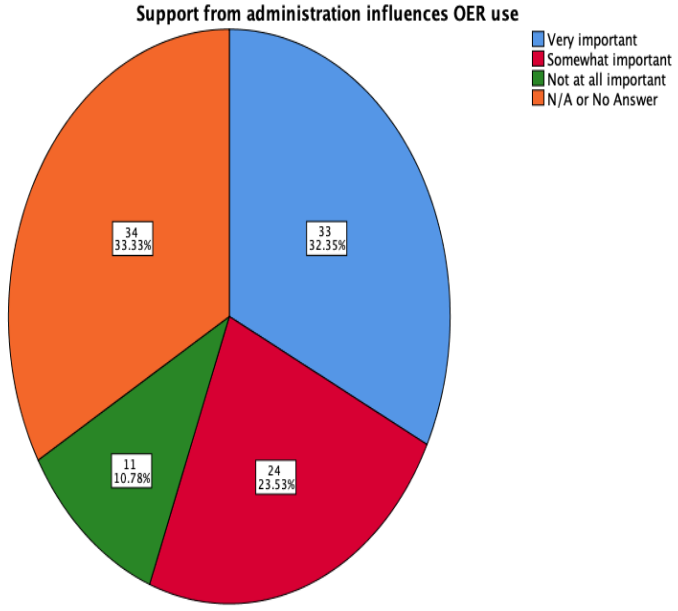

Knowledge influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
33
32.04%
49
47.57%
2
1.94%
19
18.45%

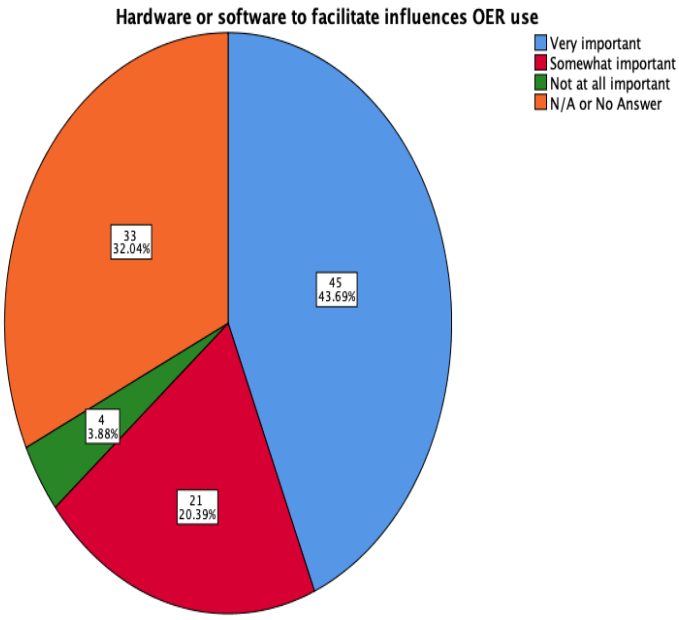

Time to find, review, and select OERs influences use
Very important
Somewhat important
N/A or No Answer
34
33.01%
49
47.57%
20
19.42%

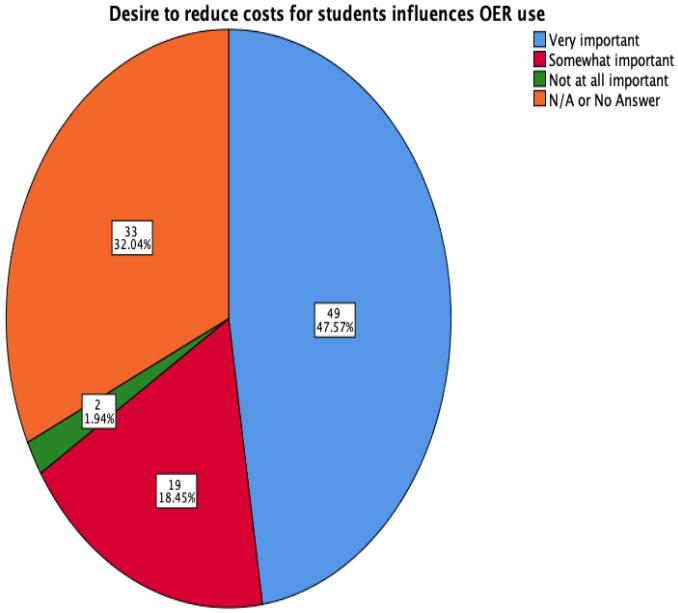

Academic quality of materials influences OER use
Very important
Somewhat important
N/A or No Answer
34
33.01%
62
60.19%
7
6.80%

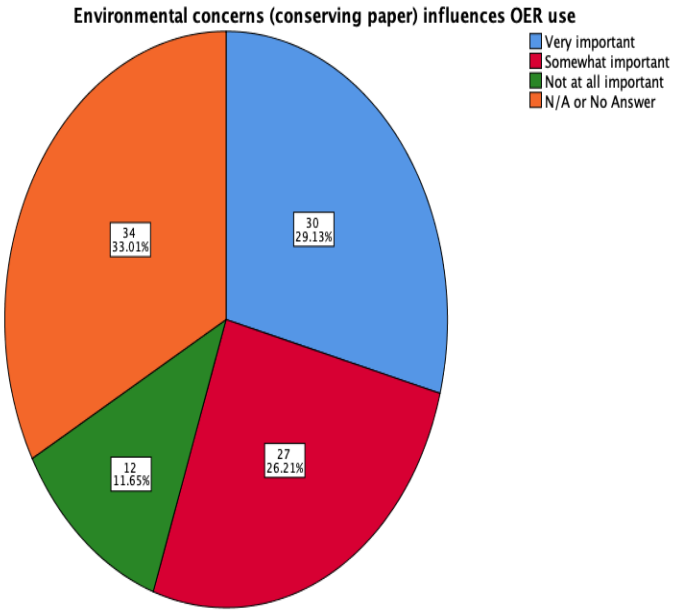

Supporting expertise influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
34
33.01%
43
41.75%
10
9.71%
16
15.53%

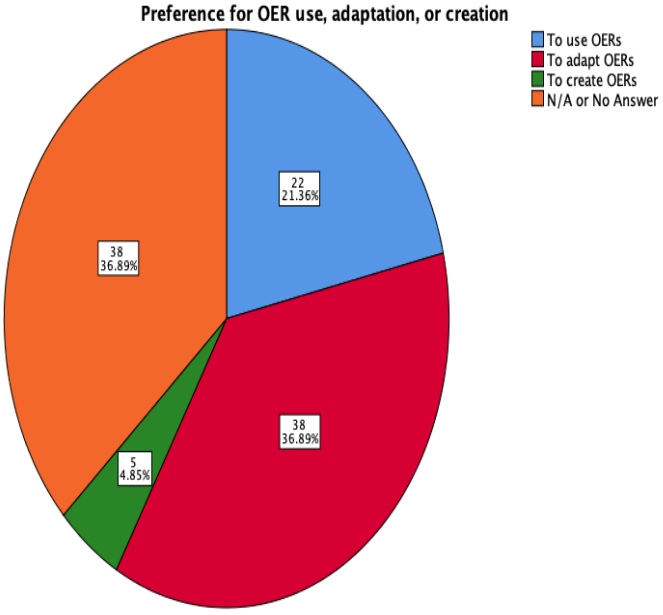

Recognition in efforts towards innovation influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
29
28.16%
25
24.27%
15
14.56%
34
33.01%

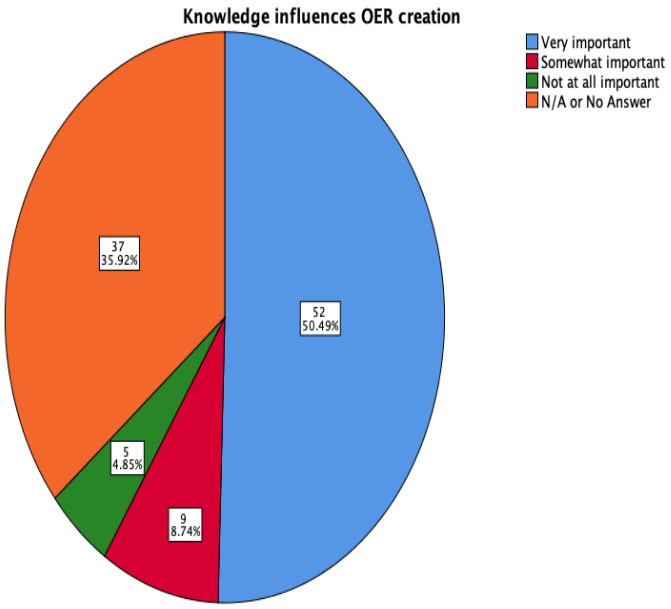

Support from administration influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
33
32.35%
24
23.53%
11
10.78%
34
33.33%

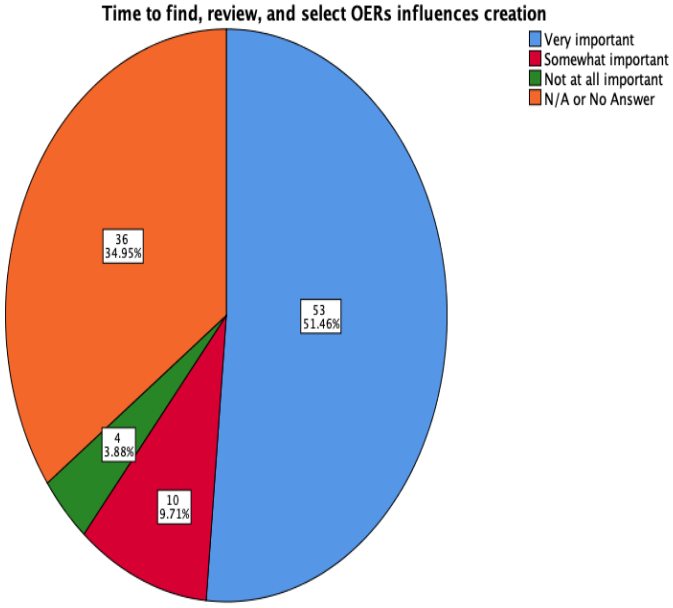

Hardware or software to facilitate influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
45
43.69%
21
20.39%
4
3.88%
33
32.04%

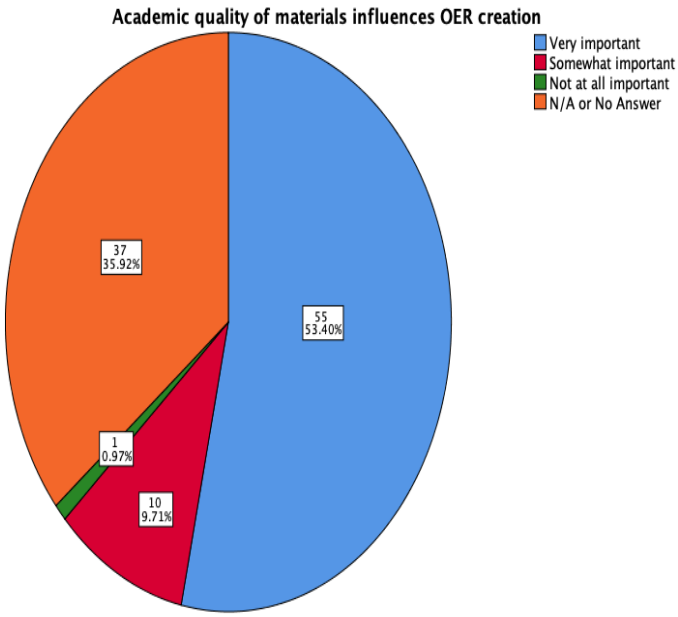

Desire to reduce costs for students influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
49
47.57%
19
18.45%
2
1.94%
33
32.04%

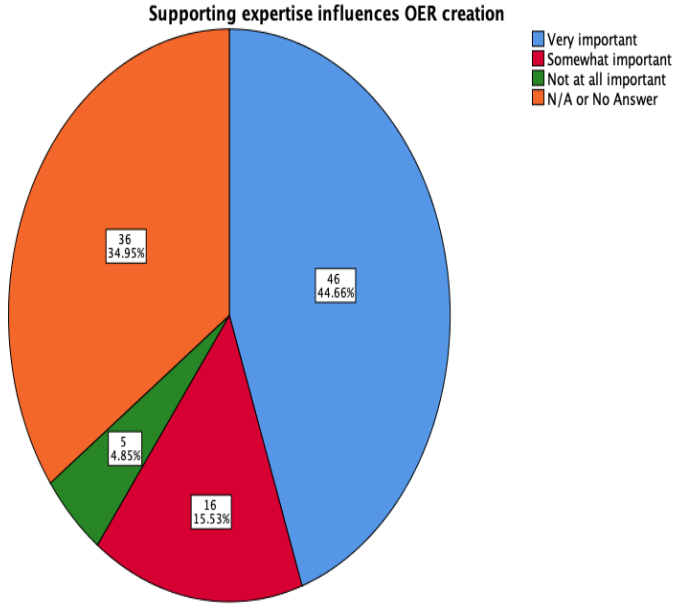

Environmental concerns (conserving paper) influences OER use
Very important
Somewhat important
Not at all important
N/A or No Answer
30
29.13%
27
26.21%
12
11.65%
34
33.01%

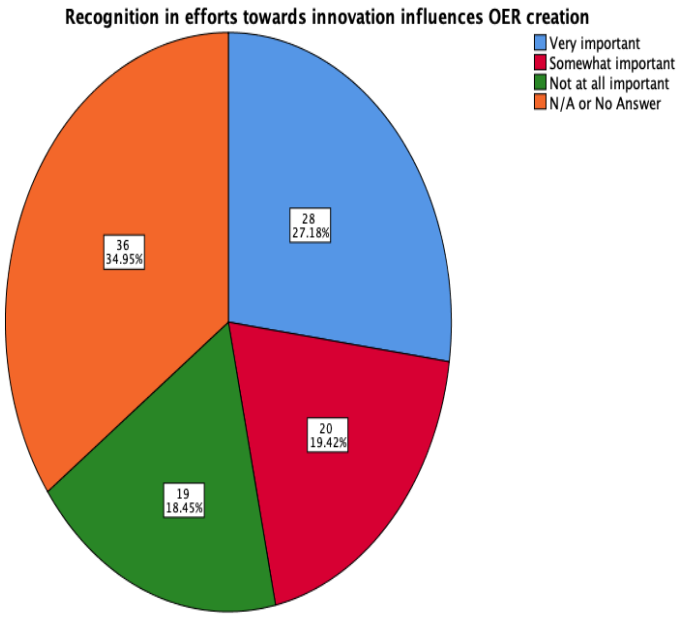

Preference for OER use, adaptation, or creation
To use OERs
To adapt OERs
To create OERs
N/A or No Answer
22
21.36%
38
36.89%
5
4.85%
38
36.89%

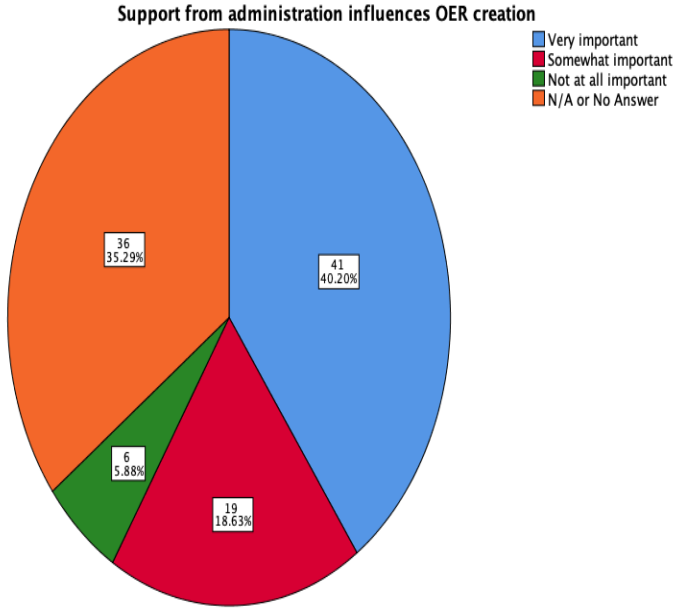

Knowledge influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
37
35.92%
52
50.49%
5
4.85%
9
8.74%

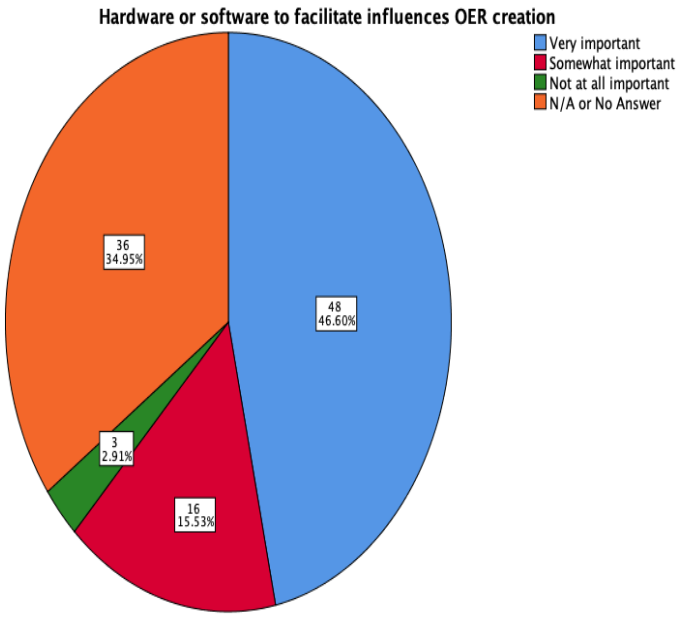

Time to find, review, and select OERs influences creation
Very important
Somewhat important
Not at all important
N/A or No Answer
36
34.95%
53
51.46%
4
3.88%
10
9.71%

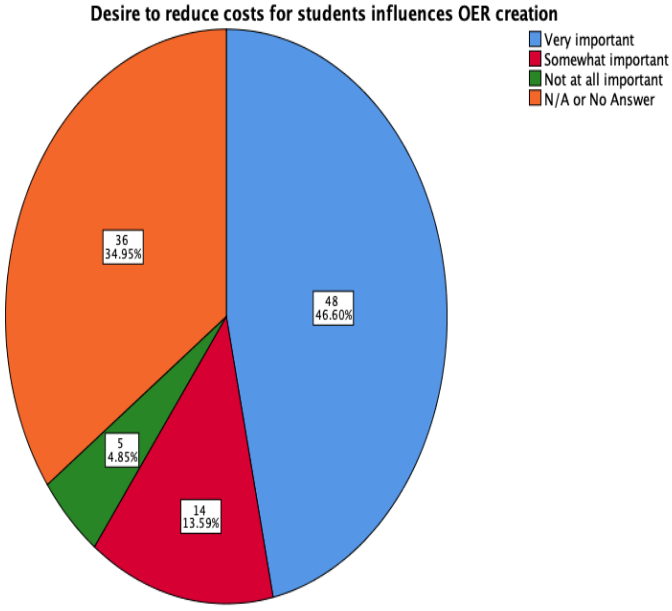

Academic quality of materials influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
37
35.92%
55
53.40%
1
0.97%
10
9.71%

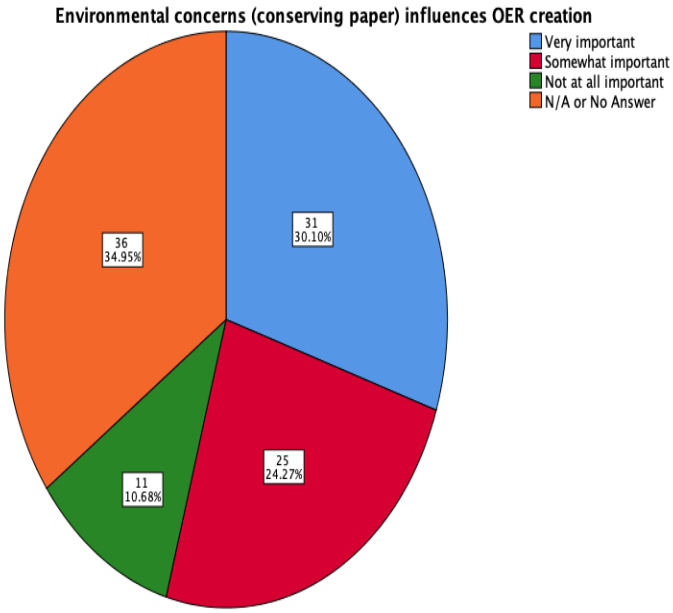

Supporting expertise influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
36
34.95%
46
44.66%
5
4.85%
16
15.53%

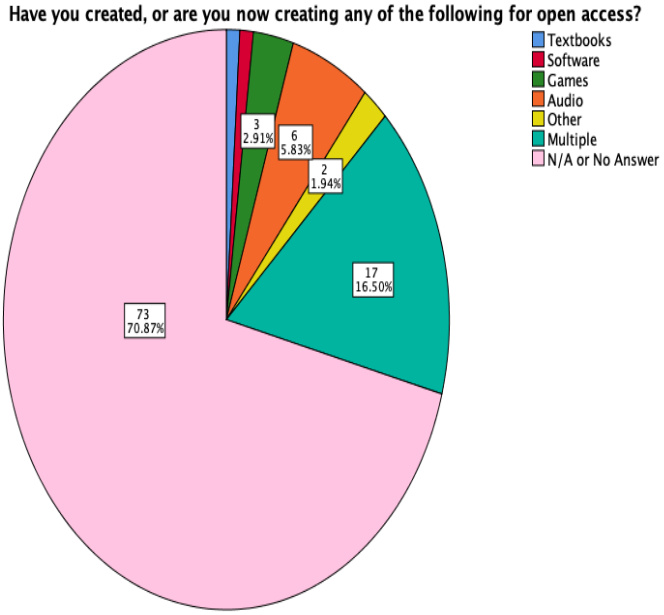

Recognition in efforts towards innovation influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
28
27.18%
20
19.42%
19
18.45%
36
34.95%

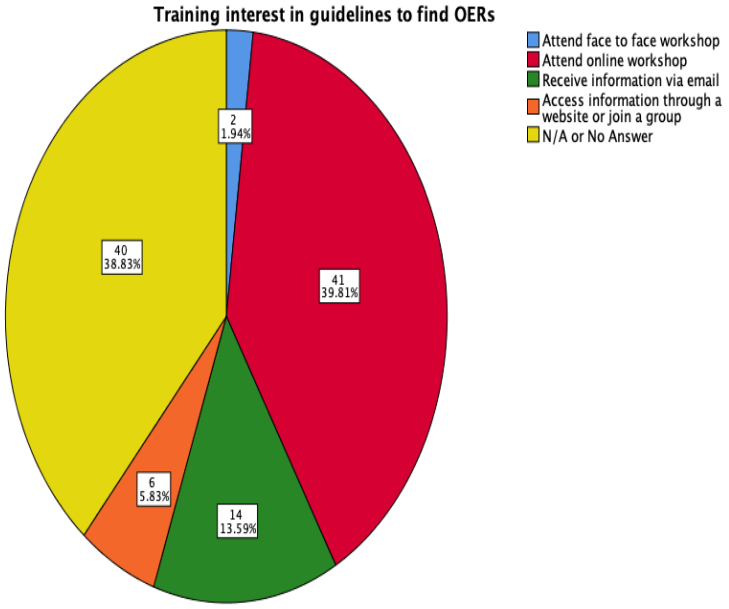

Support from administration influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
41
40.20%
19
18.63%
6
5.88%
36
35.29%

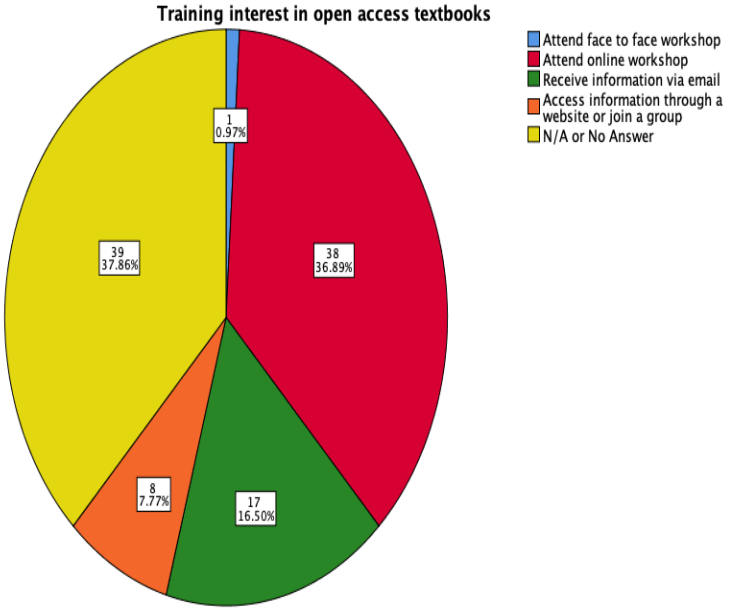

Hardware or software to facilitate influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
36
34.95%
48
46.60%
3
2.91%
16
15.53%

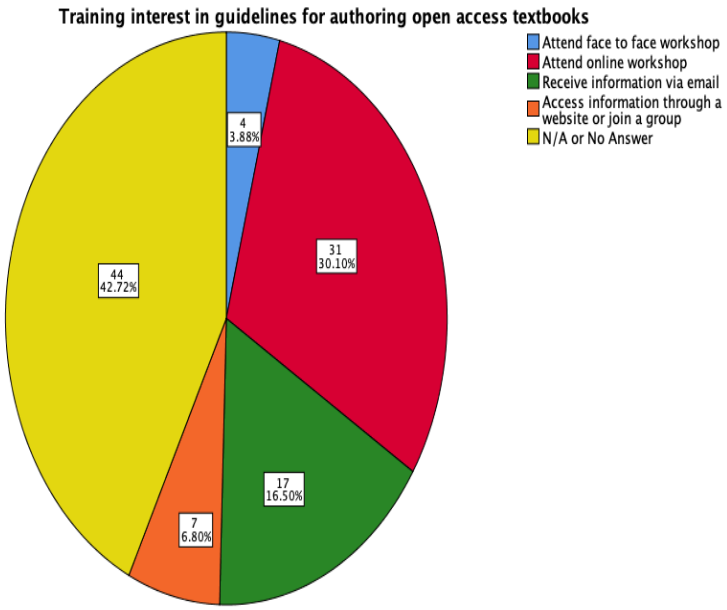

Desire to reduce costs for students influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
36
34.95%
48
46.60%
5
4.85%
14
13.59%

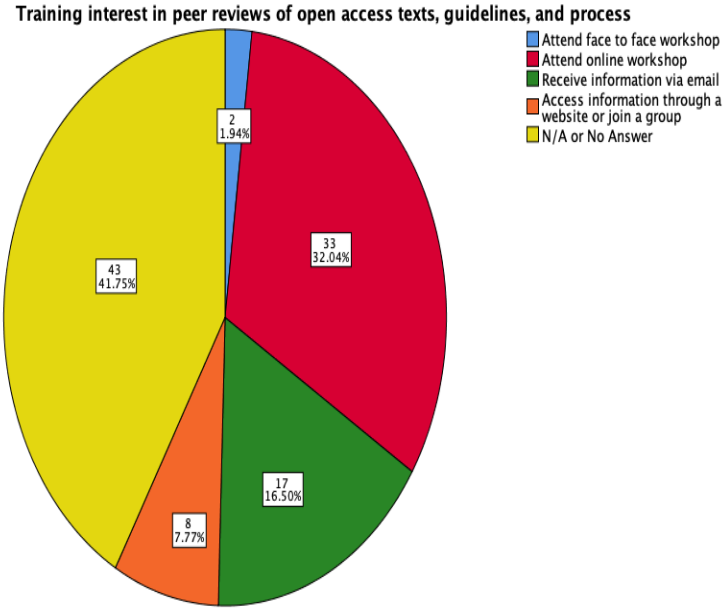

Environmental concerns (conserving paper) influences OER creation
Very important
Somewhat important
Not at all important
N/A or No Answer
31
30.10%
25
24.27%
11
10.68%
36
34.95%

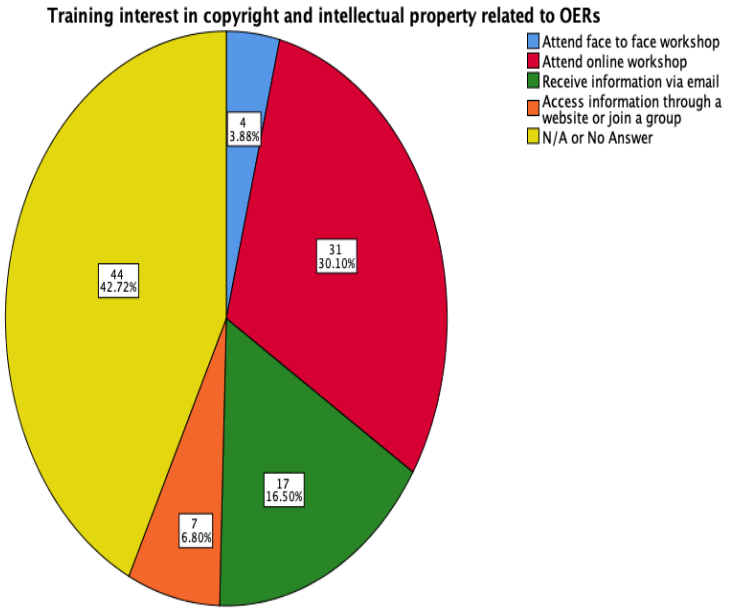

Have you created, or are you now creating any of the following for open access?
Textbooks
Software
Games
Audio
Other
Multiple
N/A or No Answer
3
2.91%
6
5.83%
2
1.94%
17
16.50%
73
70.87%

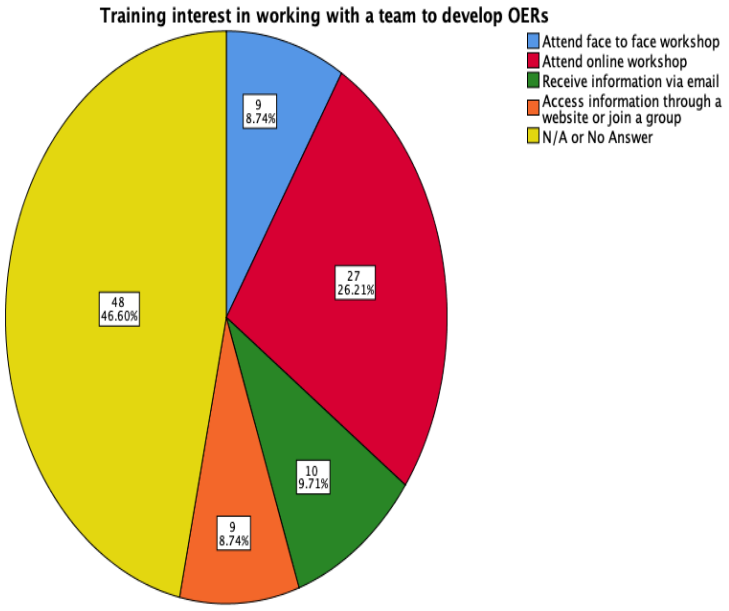

Training interest in guidelines to find OERs
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
2
1.94%
41
39.81%
14
13.59%
6
5.83%
40
38.83%

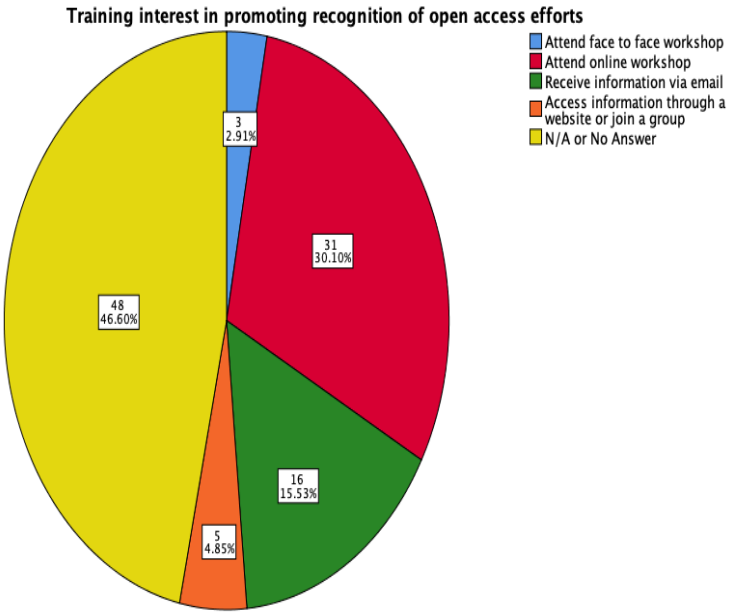

Training interest in open access textbooks
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
1
0.97%
38
36.89%
17
16.50%
8
7.77%
39
37.86%

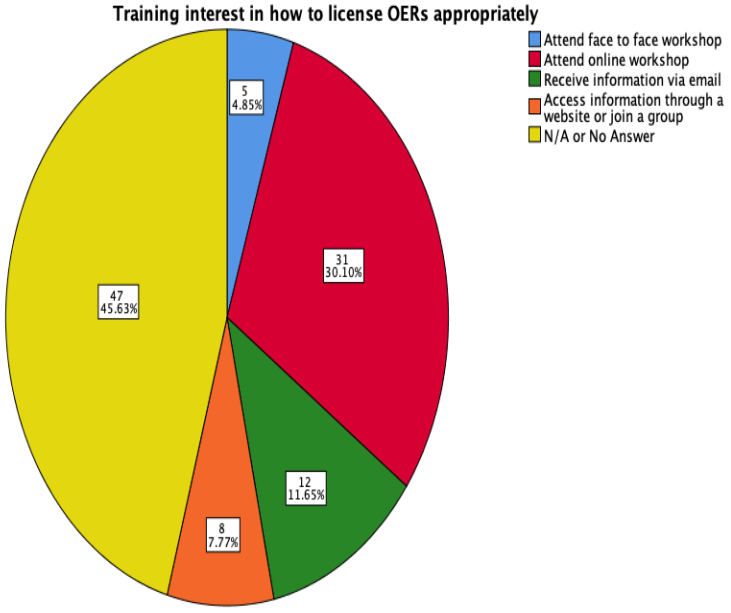

Training interest in guidelines for authoring open access textbooks
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
4
3.88%
31
30.10%
17
16.50%
7
6.80%
44
42.72%


Training interest in peer reviews of open access texts, guidelines, and process
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
2
1.94%
33
32.04%
17
16.50%
8
7.77%
43
41.75%


Training interest in copyright and intellectual property related to OERs
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
4
3.88%
31
30.10%
17
16.50%
7
6.80%
44
42.72%


Training interest in working with a team to develop OERs
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
9
8.74%
27
26.21%
10
9.71%
9
8.74%
48
46.60%


Training interest in promoting recognition of open access efforts
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
3
2.91%
31
30.10%
48
46.60%
16
15.53%
5
4.85%


Training interest in how to license OERs appropriately
Attend face to face workshop
Attend online workshop
Receive information via email
Access information through a website or join a group
N/A or No Answer
5
4.85%
31
30.10%
47
45.63%
12
11.65%
8
7.77%