

*Using Maximum Variation Strategy Within A Case Study to Investigate Reasons Contributors are Willing to Provide Open Educational Resources*

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**Abstract**

The intent of this exploratory study was to increase the body of knowledge and guide decisions regarding sustainability of Open Educational Resources (OER). Previous studies have reported one of the challenges facing facilitators of OER repositories is teachers' lack of willingness to contribute their instructional materials. This study, in contrast, investigated the reasons teachers *are* willing to develop and share OER instructional materials. Six cases (who were previous contributors to an OER repository) were chosen for face-to-face interviews using a maximum variation strategy. The goal of this unique strategy is to choose cases that will maximize learning by selecting individuals with a wide range of characteristics. Interview questions were developed to explore the question, "Why do CTE teachers contribute their intellectual capital to OER repositories?" Data condensation and data display strategies were implemented during data collection in order to interpret patterns and form conclusions. Inductive and deductive reasoning were utilized during data analysis, which included pattern coding. After pattern coding was finalized, cross-case analysis was conducted to enhance transferability and to deepen understanding. Triangulation was utilized to corroborate findings. The most significant finding of this study was that all cases expressed an understanding of the significance of contributing to OER as a result of previous teaching experiences categorized into three areas: professional experiences, challenging experiences, and networking experiences.

Keywords: open educational resources, OER, OER contributors, maximum variation strategy

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## Introduction

The purpose of this study was to investigate why Career and Technical Education (CTE) teachers are willing to develop open educational resources (OER). A multi-case study methodology was utilized to interview six individuals who had contributed their intellectual property to an OER repository. Utilizing maximum variation strategy, individuals with a wide range of characteristics were chosen as cases in order to gain a deeper understanding. The findings of this study will contribute to the larger understanding of OER repositories for all teachers. With this understanding, facilitators of OER repositories can make future evidence-based decisions regarding the sustainability of OER repositories.

The site chosen for this case study was the Kanas Center for Career and Technical Education (KCCTE) Resource Library, located on the campus of Pittsburg State University (PSU) in Pittsburg, Kansas. The purpose of this professional development center for CTE teachers is to promote retention. The four main areas of support provided are:

- technical workshops to enhance industry skills
- OER resources to alleviate cost and time in instructional preparation
- mentoring for teachers within their first two years of teaching, and
- technical teacher education coursework for educational advancement

The KCCTE was developed as a response to the United State's nationwide gap between the amount of technical workers needed and the available skilled technicians to fill open positions (Kantrovich, 2007). This push for a more technically trained workforce has led to a need for more CTE teachers (Rojewski, 2002). While recognizing the need for more CTE teachers, there is a growing awareness of retention issues of CTE teachers, creating a CTE teacher shortage (Chenevey, Ewing, & Whittington, 2008; DeLay, 2013; Greiman, Walker, & Birkenholz, 2005; Johnson & Birkeland, 2003). The state of Kansas funded the KCCTE to provide support to CTE teachers in order to enhance the pipeline of skilled workers across the state.

Some of the challenges reported in earlier research include the need for an ever-changing technical curriculum (Skinner, Witte & Witte, 2011), a limited amount of time to plan and develop instructional materials (He & Cooper, 2011), and shrinking budgets (Chenevey et al., 2008; DeLay, 2013; Greiman et al., 2005; Johnson & Birkeland, 2003). One initiative developed by the KCCTE was to provide an OER repository specifically for CTE teachers in order to alleviate the excessive amount of time used for curriculum development.

While OER is growing in popularity (Schmidt-Jones, 2012; Tonks, Weston, Wiley, & Barbour, 2012; West, 2016; Wiley & Gurrell, 2009; Wiley, Hilton, Ellington, & Hall, 2012), there are also concerns about sustainability (Atenas & Havemann, 2014; McShane, 2017; Nascimbeni & Burgos, 2016). One important benefit is the cost savings to students who are not required to buy textbooks when an instructor adopts an OER textbook (West, 2016). According to Atenas & Havemann (2014), the promotion of OER leads to the opportunity for teachers to provide students with a higher quality instruction. Additional studies have explored the challenges facing OER repositories (Atenas & Havemann, 2014; McShane, 2017; Nascimbeni & Burgos, 2016; Pirkkalainen, Pawlowski, & Pappa, 2017; Wiley & Gurrell, 2009).

Quality of materials and sustainability of online instructional materials (Pirkkalainen et al., 2017) are two challenges OER librarians are faced with. Other challenges include the tedious tasks of selecting, organizing, disseminating, cataloging, updating, and promoting materials (West, 2016). Concerns have also been expressed about the quality of OER in terms of meeting state standards (Wiley & Gurrell, 2009).

Being aware of the challenges associated with facilitating an OER repository, the KCCTE provides OER instructional materials in an editable online format. Authors are provided a stipend for the development of their course. A user-friendly online platform is utilized for authors to submit their materials. Tutorials and a KCCTE staff member are devoted to assisting authors through the process. Materials are developed using required templates and specifications. A subject matter expert (SME) reviews all materials for relevance to the CTE area, offering suggestions for improvement before materials are published. Materials are reviewed and updated biennially. All materials are free to download, editable, and have no copyright restrictions attached. While recognizing the importance of each carefully developed procedure for developing materials, this study focused specifically upon why CTE teachers are willing to provide resources to the KCCTE Resource Library. It is acknowledged that without a continual growth of contributors, it is impossible to sustain the repository.

## **Body**

The research question that guided this study was, “Why do CTE teachers contribute their intellectual capital to OER repositories?” Because the researchers are asking “why”, a qualitative research method was utilized. To gain a more descriptive understanding of *why* or *how* things work, Patton (2014) suggests a qualitative study because it enables the researcher to capture people’s stories. Within the qualitative methodology, a case study design was chosen. Creswell (2013) defines the case study as a “real-life, contemporary bounded system (a case) through detailed, in-depth data collection involving multiple sources of information” (p. 97).

A maximum variation strategy was utilized for choosing cases to interview (Krathwohl & Smith, 2005; Bloomberg & Volpe, 2016; Creswell, 2013). The goal of this strategy is to select individuals with a wide range of characteristics (Bloomberg & Volpe, 2016). The KCCTE Resource Library was the chosen site for this study because of the researchers’ close involvement with the development and maintenance of the OER repository. The following criteria were met to be considered as a case for this study:

- (a) Must currently be teaching Career and Technical Education (CTE) course(s) in a secondary or post-secondary institution.
- (b) Must have submitted one or more open educational courses to the KCCTE Resource Library.
- (c) Must have successfully met all obligations of the KCCTE Resource Library Contributor Agreement.

At the time of the study, 15 full-time CTE teachers had successfully contributed complete courses to the KCCTE Resource Library as shown in Table 1. These curriculum contributors were current teachers from six CTE career fields (Agriculture, Business, Family & Consumer Sciences, Media & Technology, Design,

Production & Repair, and Health). At the time of the study, it seemed important to gain an in-depth understanding of this phenomenon by interviewing someone who had contributed often and someone who had chosen to only contribute once. Insight was also expected to be gained by choosing cases from the various CTE content areas from both secondary and post-secondary institutions. It was assumed that by choosing cases with a wide variety of characteristics, a more in-depth understanding of all CTE teachers would occur.

<b>ID</b>	<b>Career Field</b>	<b>Teaching Level</b>	<b>No. of Course Contributions</b>	<b>Distance (one way)</b>
01	Agriculture	Secondary	1	70 miles
02	Agriculture	Secondary	1	483 miles
03	Business	Secondary	1	25 miles
04	Business	Secondary	1	291 miles
05	Media & Technology	Post-Secondary	1	0 miles
06	Media & Technology	Secondary	2	104 miles
07	Media & Technology	Secondary	1	109 miles
08	Design, Production & Repair	Post-Secondary	3	0 miles
09	Design, Production & Repair	Post-Secondary	2	240 miles
10	Design, Production & Repair	Secondary	1	120 miles
11	Design, Production & Repair	Secondary	1	120 miles
12	Family & Consumer Sciences	Secondary	5	179 miles
13	Family & Consumer Sciences	Secondary	3	131 miles
14	Family & Consumer Sciences	Secondary	2	57 miles
15	Health	Secondary	2	105 miles

Table 1: Possible cases

These 15 cases were input into a table and sorted first by career field, then by teaching level, then by the number of courses contributed to the KCCTE Resource Library, and finally, by geographical distance from PSU. After the sort, the first person from each career field was chosen and invited by email to participate in a face-to-face interview. Taking time constraints into consideration, the most convenient location was the deciding factor when all other factors were equal. All six cases shown in Table 2 were chosen and invited by email to participate in the study, and all six accepted the invitation.

From the Agriculture career field, two teachers had contributed. Both were secondary teachers who had contributed one complete course. Because all variables were equal

between the two contributors, this case (listed as ID 01 from Table 1) was chosen based upon location convenience.

From the Business career field, two teachers had contributed courses, and the case invited to participate (listed as ID 03 in Table 1) was chosen due to location convenience. Both possible cases were secondary teachers and had submitted one course to the KCCTE Resource Library.

There were three contributors who met the defined criteria from the Media & Technology career field. The case chosen (listed as ID 05 in Table 1) was a post-secondary teacher who had submitted one course. As there are fewer post-secondary contributors than secondary contributors, it was expected that this participant might provide insight into the perceptions of post-secondary teachers' willingness to provide content to OER repositories.

From the Design, Production & Repair career field, four teachers had contributed a total of seven courses. The Design, Production & Repair career field includes teachers from the architecture and construction, engineering, manufacturing, and transportation career fields. Three of the possible cases in this career field teach automotive courses, and one teaches drafting courses. Two possible cases teach at the post-secondary level, and two at the secondary level. In an effort to gain diversity, the case chosen for this career field (listed as ID 08 in Table 1) was a post-secondary teacher who had made three submissions.

The chosen case from the Family & Consumer Sciences career field (listed as ID 12 in Table 1) is a secondary teacher who had developed and contributed five courses, the most contributed to the KCCTE Resource Library. The Family & Consumer Sciences career field teachers collectively have contributed 10 courses, the most content submitted by one career field to the KCCTE Resource Library.

The sixth case (listed as ID 15 in Table 1) is a secondary teacher from the Health career field. This teacher has contributed two courses to the KCCTE Resource Library, and at the time of this study, was the only Health teacher meeting the set criteria.

<b>Career Field</b>	<b>No. of Course Contributions</b>	<b>Teaching Level</b>
Agriculture	1	Secondary
Business	1	Secondary
Media & Technology	1	Post-Secondary
Design, Production & Repair	3	Post-Secondary
Family & Consumer	5	Secondary
Health	2	Secondary

Table 2: Characteristics of chosen cases

Many forms of data were collected during this study. Primary data was obtained through semi-structured interviews of the six chosen cases. Two pilot interviews were conducted to refine the interview protocol. Each interview was scheduled for an hour and a half and interviews were recorded and transcribed. Contact summary forms were completed and sent to each case to confirm an accurate perception of each case's responses. All six contact summary forms were approved. Secondary forms of data included gathering forms and information recorded during the contribution process for each case. The secondary forms of data were used for corroboration of data gathered during interviews and aided in providing triangulation during the collection, analysis and findings phases of the study.

During data collection, three actions were conducted simultaneously in an effort to add clarity as recommended by Miles, Huberman, & Saldana (2014): data condensation, data display, and forming conclusions. Data condensation involves transforming the data as it is collected into a chunked, stronger version. Data display involves creating organized tables and other documents in order to better understand what is happening. Forming conclusions involves interpreting patterns and propositions emerging from the data (Miles et al., 2014). During transcription, data was coded using the comment feature with Microsoft Word. These codes were then exported from Word using a macro to an Excel document where they could be chunked and pattern coding was applied. Cross-case analysis was also possible during this step, allowing for transferability of the study. This process also resulted in data condensation. Once the patterns were discovered and data was categorized into a workable number, the data was transferred to data display tables. The visual representation of data allowed conclusions to be formed.

One of the most significant findings of this study was that All cases (6 out of 6 [100%]) expressed an understanding of the significance of contributing to OER as a result of a previous experience as a CTE teacher.

As shown in Table 3, previous experiences were divided into three subcategories: professional experiences, challenging experiences, and networking experiences. Two teachers reported that the primary factor in their decision to contribute was the importance of sharing the knowledge they had acquired from their years of professional experience.

There's just that altruistic piece of, I have a lot of knowledge to share... And what an amazing thing for me to be able to go through the creative process of building a lesson from that information, and then share it with somebody else. That feels like the right thing to do to me. That's what motivates me. And that's part of why I do this, you know? (Interview 04)

Another teacher expressed the contributing factor as an opportunity to be part of the movement of OER.

While almost all teachers reported the challenges of curriculum development for CTE teachers, two teachers expressed the initial contributing factor as an opportunity to help themselves be more organized by developing a more detailed curriculum, and one expressed the desire to help other new teachers who might be facing challenges. Another teacher expressed the primary contributing factor as a perceived benefit for others, reporting a desire to give back.

I vividly remember starting teaching and having nothing and relying on others to help. As a new teacher, you're just struggling to manage classroom things, let alone, now you've got to create curriculum, and from my standpoint, if I had not been told to give teaching two years, I would've quit the first year and I understand why they tell you that and it shouldn't be that way. So, you know, I kind of feel strongly that if you're going to go into teaching to start with you're already taking a cut in pay, and especially in the automotive area. You've got skills that are very, very marketable. And to make it hard on you, to start with, is just asking for people to leave the profession before they even get started. I would hope that any veteran teachers out there would jump on the opportunity to share what they have. I think most of us have the same story as I have starting out and struggling. (Interview 02)

All but one teacher expressed an understanding of the networking benefits they had previously experienced and wanted to continue. One teacher mentioned that she was already informally sharing curriculum through email and how much easier it was to guide teachers to the library instead of transferring large amounts of files through email.

Subsection	Themes/Comments within Subsection	Cases who Reported this Theme/Comment
Professional experiences	Legacy	02, 04
	Opportunity to be part of the OER movement	01
Challenging experiences	Curriculum development	01, 02, 03, 04, 05
	Extra duties	02, 03, 04, 05
	Lack of resources	01, 02, 03, 05
	Teaching workforce skills/hands-on teaching	01, 02, 03, 04, 06
	Time required outside of school day	02, 03, 05
Networking experiences	Formal sharing	01
	Informal sharing	02, 05, 06
	Mentoring	04, 05

Table 3: Responses to Previous Experiences

## Conclusions

While understanding the significance of OER to the CTE teacher seemed to be the most significant factor, this study also revealed that an opportunity to receive a stipend, having enough time to develop the materials, and being familiar with the entity hosting the materials were important as well. Through this study, several opportunities for further research have surfaced. Naturally teachers who alluded to leaving a legacy were demographically categorized in the above age 31 group. It might be beneficial for OER repository facilitators to further investigate the

correlation between willingness to contribute and the years of experience of the teacher. The topic of stipend seemed to illicit a variety of responses. Further investigation into the correlation between willingness to contribute and the opportunity for monetary rewards would provide further input to OER sustainability. Finally, one case reported that the initial reason for contributing was to be more organized. This response might indicate that the contribution process was more valuable to the contributor than the end user. OER repository facilitators might be interested in pursuing a study to understand this benefit to the contributor.

Interestingly, utilizing the maximum variation strategy did not seem to have an impact on this study. No significant differences were found between different content areas, teaching levels or number of courses contributed. While the researchers were expecting that some content area teachers might receive more support or have more resources available to them because of their content area, there were no findings to support this.

By exploring this topic, the researchers have been able to utilize the findings to make decisions regarding recruitment of contributors. Holistically, an increased understanding of the perceptions and experiences of CTE teachers who have created and shared instructional materials will potentially benefit the OER community. Teachers with increased access to affordable, copyright free materials will have more opportunities to bring innovative lessons to their students providing them with the knowledge and skills necessary to prepare them for a variety of careers. For CTE students, this opportunity of receiving a more rigorous technical education, places them in the position to obtain high-demand, high-wage technical positions in the workforce. This, in turn, can help alleviate the gap existing in the nation's technical workforce (Skinner, Witte, & Witte, 2011).

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