

ALCTS EXCHANGE 2017 | Day 4, Skill Building for Effective Use of Multidimensional Measurements in Collection Assessments

>> SPEAKER: Good afternoon, and thank you for joining us for this pop out of the box session. Today, we will be discussing skill building for effective use of multidimensional measures in collection assessment. Before we begin, allow me to take just a moment for brief introductions. Speaking today will be Karen Harker, the University of North Texas collections assessment librarian, and I'm Janette Klein, a Ph.D candidate and graduate research assistant to Karen. We are very excited to share with you some of the insights and knowledge that we've obtained throughout the years on the subject of multidimensional measurements. Throughout the session this afternoon, we will have three main areas of emphasis. First is to understand the limitations of conventional one-dimensional collection analysis measures. Second is to learn how to calculate three key collection measurement ratios, and third is to identify collection discrepancies and areas of opportunity using the multidimensional measurement ratios that we learn to calculate throughout this session, but we do want to emphasize that due to the diverse nature of our audience, this content may be pedantic for some audience members, but for others, this may be completely new content and a new way of thinking, so please do bear with us and be patient as we cover the foundations and mechanics of working with multidimensional measurements and ratios in addition to the more advanced content. Additionally, we'll be providing several opportunities throughout the course of the session for you to engage in some basic math as part of working with the ratios, so make sure that you have some scratch paper and a pen, your calculator, or the calculator feature on your phone ready to go. A key aspect to the functioning of libraries is that of collection development, management, and assessment. With demand-driven acquisitions becoming an integral part of library processes, collection development is experiencing an increase in corresponding workload in an effort to reduce the workload of subject librarians so they can better serve the needs of faculty, students, staff, and patrons.

As Karen notes in the accompanying statement, there is an opportunity cost related to this process as each decision to purchase one item over another item results in a cost to the patron for that item not acquired. Librarians working in collection assessment face the challenging task of compiling and working with data in an effort to provide relevant information that can facilitate informed decision-making. One key way of doing this is through the measurements. Here is a one-dimensional measure. That is number of holdings. According to this, it says we have over 2.4 million holdings. Okay, so what? Is this good? Is it bad? It sounds really good, but you don't actually know, because you have nothing with which to compare it. One-dimensional measures are usually easy to generate and to sort, because they involve only one calculation or gathering of data, but they are truly meaningless by themselves, because they lack context, nor is there anything against which you can compare them. A more effective way to glean meaning from the data is through the use of multidimensional measurements, but what are multidimensional measurements? It is simply one measure plotted against one or more measures. As we can see here, we have a multidimensional measure that contains two measures. That is data on both holdings and category, or in this chart, we can see that we have a total of three measures. That is holdings, category, in this case, very broad categorizations of arts and humanities, business, education, interdisciplinary, etc., and format. The result of this is that any one of these measures, such as holdings, checkouts, purchases or loans are shown in column A and can be plotted against any of the potential measurements, such as subject, patron type, or format, as shown in column B. A simpler way to view this data is in a scatter plot. In

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this case, for each collection, we've plotted the current holdings, the Y axis, against the total checkouts, the X axis, and with color, we've added a third dimension, that of subject category as shown by the legend. The plot for history is noted. You can also see a pattern emerging. That is that total holdings for strongly related to total checkouts. As shown by the lines, it's almost a 45-degree angle. But what exactly are ratios? Ratios are efficient measures of effectiveness that display a quantitative relation between two values that may or may not be of the same set, and further, they may or may not be the same unit of measure. In other words, a ratio is a comparison of a dependent factor against an independent factor, or you can actually think of it as the action-based denominator being divided by that which you don't know, the numerator.

So, ratios can be expressed in a few different ways. The most common is that of a fraction, such as four-fifths, but often, ratios are also seen in a decimal format, such as four-fifths actually being 0.8, but they can also be expressed as a percentage, which is a special type of ratio where the numerator must be a subset of the denominator, thus not all percentages are ratios and not all ratios can be expressed as a percentage. So, this all sounds well and good, but if you're thinking to yourself that you're never going to use this information, you actually use ratios every day. When calculating the miles per gallon for your car or the cost per ounce or pound at the grocery store, and also, the price per gallon may be a consideration, whether it's gasoline for your vehicle or a gallon of milk to take home, they're examples of daily use of ratios, and ratios aren't quite so scary when put into this type of general life perspective. So, let's start simple and return to real life examples that we encounter every day. We're going to actually do two applications of ratios. The first is we're going to calculate the miles per gallon if you traveled 367-miles and need a total of 12 gallons to refuel. The second is a little more specific to libraries, and we're actually going to be calculating the cost per use of a new book that was purchased for \$500 over the past 12 months, and it has a total of 12 uses. Using the two poll features that have popped up on your screen, you can either answer individually or as a group once you've reached consensus, but please do respond to both, and we will give you 60 seconds to work through this. So, how did we do? Well, let's take a look at this. Good. Good. So, in the car example, the miles per gallon would actually be 30.58, and it looks like we had a pretty strong response that was correct on that. Additionally, for the cost per use example, that actually would be \$41.67 per use.

So, it's an interesting way to look at ratios once again, but now we're going to turn our attention to ratios that are more specifically related to libraries. Examples of these include faculty divided by library materials expenditures or acquisitions holding acquired divided by expenditures, where expenditures in both these examples are the dependent factor and are highlighted in pink. Another example would be undergraduates divided by expenditures, where undergraduates are the action-based independent factor, your denominator, and expenditures are that which you don't know, your dependent factor or numerator, and are highlighted in blue. There are many ways in which ratios can be used in library settings, but the most important decision that needs to be made at the start of the process is to determine what message you are trying to share with your audience. That will influence the type of data used in creating the ratios at your institution. Earlier, we had touched briefly on how percentages were a specific, special kind of ratio. Now we're going to delve a little deeper into percentages as ratios, but before we do, remember that the numerator must be a subset of the denominator, which is different than the previous ratio of miles per gallon or that of cost per use. So,

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if we were to calculate the percentage of holdings, we would need the following data; the total of all holdings, our independent factor, and the collection-specific holdings, our dependent factor, which is a subset of our denominator. When the total holdings are divided by collection-specific holdings, the result is a percentage of holdings.

Let's use some real numbers to apply this equation in the calculation of music holdings. For example, at UNT, we have total holdings of 2,479,678. The result of this is that music holdings comprise 8.37 percent of the total UNT holdings. The same process can be applied to economic holdings. Once again, the total holdings stay constant at 2,479,678, but in this case, the economic holdings are only 44,696, and thus economic holdings are only 1.8 percent of total UNT holdings. Now we're going to shift focus a little bit and talk about enrollment, and we're going to have an opportunity for you to calculate the percent of music enrollment and the percent of music circulation on your own using the following data. For the first poll, we calculate the percentage of music enrollment using total enrollment of 418,201 and music-specific enrollment of 17,216. The second one you see is to calculate the percentage of music circulation and music circulation specifically. So, using the poll feature, please indicate your responses as an individual, or if you're viewing as a group, when you've reached a collective decision. We'll give you another 60 seconds to complete the two polls. So, let's see how the results of the music enrollment poll turned out. Excellent. As we can see, the result of dividing the total enrollment by the music enrollment results in music enrollment comprising 4.12 percent of total enrollment. Similarly, on the second poll, we can see that music circulation comprises 8.37 percent of total circulation. So, why does any of this matter? Multidimensional ratios mitigate the limits of one-dimensional ratios by providing context, a means of comparison and meaning to the data that we use to inform a decision-making process. Using multidimensional ratios as part of library assessment facilitates the demonstration of value through the use of resources, how we are meeting needs, and institutional value. Additionally, as librarians, we work in a culture of assessment, constantly seeking ways to determine how we are meeting client needs, and also, in determining the quality of our collection. Earlier, we had mentioned that we could use ratios to tell the story of the library, but we needed to determine how we list the narrative to proceed.

A way of doing this is by thinking about the types of questions you are asking of the collection and then determining the ratio that can help answer those questions. For example, the ratio of enrollment by college could be used to answer a needs-based question. The ratio of percentage of checkouts by format or subject can inform decisions related to collection use. Other needs questions, such as those related to faculty or students, could use ratios related to percentage of checkouts by patron group or even by college, while the ratio of borrowings to holdings can be used to answer the key question of how well needs are being satisfied. Each of these ratios help by providing information that is useful in answering the questions contained within your narrative, but now we're going to shift gears a little, and Karen is going to speak on the topic of ratios of ratios.

>> SPEAKER: Hello. This is Karen Harker. I know you can't see me, but now that Janette has covered the basics of ratios, we are going to, um, we are ready to take this to the next level by comparing ratios. These compound ratios enable you to merge four measures. I hope this opens your mind into what these measures and calculations can do. As Janette had demonstrated earlier, a

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single ratio can effectively shrink two measures, like checkouts and holdings into a single number or measure. Here, we divide checkouts by holdings to get 0.4485, or just one checkout for every two volumes. Comparing two ratios doubles this feat. For example, comparing the percentage of checkouts in a specific subject with the percentage of holdings provides some context of the former. A particular subject, say history, may represent a large percentage of the circulated titles, because it represents the large portion of the collection, but if the distribution is smaller than that of its holdings, this may be a cause for concern. So, now our compound ratio reduces four measures into one value, number of checkouts in a particular subject, total number of checkouts, number of holdings in that subject, and total holdings. This provides context and comparison for that first or top measure, in this case, checkouts by subject, which by itself does provide mean. So, you may need to think about these meanings just a bit until it becomes automatically recognizable to you, but it is intuitive. If the two ratios or numbers are exactly the same or very, very close, then the resulting ratio will, of course, be one. Any number divided by itself, of course, is one.

Now, the numerator, if the numerator is less than the denominator, then the ratio will be less than one. So, if the percentage of holdings for history is less than the rate of enrollment for history college, then that ratio will be well below one. Conversely, if the ratio is greater than one, then that results from the numerator being greater than the denominator. In this case, the distribution of holdings for English is greater than the distribution of English students enrollment. We librarians have traditionally analyzed collections by subjects. This analysis may be based on collection systems. For our purposes, we have used the OCLC classification because we're using the collection evaluation system, which uses this structure. However, there's certain limitations to these subject-based analyses. There is a trend of interdisciplinarity. Subjects are just not as segregated or siloed as they used to be perceived. Also, not everything uses the same organizational structure. Finally, your subject collections may be mutually exclusive, or they may be overlapping. For us, we chose overlapping, because, um, which addressed the issue of interdisciplinarity, but it does require a different way of interpreting distribution ratios, the sum of which may be much greater than the whole. While librarians have compared circulations and holdings by subjects before, his use factor is simply that ratio of the distribution of circulation and the distribution of holdings for a particular subject. They continued in this vein, comparing the percentage of ILL borrowing requests made in a certain subject and the percentage of holdings owned by that subject, by that library on that subject. His paper includes more in-depth analyses of this ratio of borrowings to holdings, including benchmarks of concern and interpretations of values that exceed these benchmarks. I highly recommend you read or reread it to generate your own ideas.

The holding factor is something we started using here at UNT as a way of determining how well the library is meeting the needs of its students. We compared the distribution of materials found with the distribution of students in a particular subject or school. We use these key collection ratios for our collection analyses. Here's an example of these such analyses for our arts and humanities collections. You can see here the percentages that are used for the calculation of our key collection ratios, holdings factor, use factor, and ratio borrowings to holdings. You can also see that for some subjects, like theater, the ratios are very close to each other, near or around one, while others, like philosophy, the ratios vary widely, with holdings factor of nearly six and a moderately low use factor. Generally, very

low values of each of these ratios indicates that the factor is much lower than expected given its context. For example, a very low holdings factor suggests that there are too few holdings given what it's compared against. Conversely, very high values indicate much greater than expected, given the context against which it is compared. There's a more specific example of applying these ratios for decision-making. Recall that the holdings factor compares distribution of holdings against the distribution of students in that discipline. In our example, the holdings factor for history is four. This indicates that we have a very large history collection, but relatively low lower enrollment in history programs. You could consider why this would be the case, what factors would make our collections of history large or enrollment low. What, if anything, could be done to reduce this apparent inequity? We don't have the answers for you, these are questions you need to answer for yourself. The ratios, however, help you see your collection within this context. We don't have time to go into applying all of the other ratios to making collection decisions. There are scenarios in the discussion guide which will provide you with the opportunity to think about what these ratios tell you about your collections. Our main focus for this far too short workshop was more technical. We wanted to make sure you understand how the ratios themselves work. For example, what would happen if we increased one number or part of the ratio, like the numerator? If the numerator is increased by two but the denominator remains constant, what impact will this have on the holdings factor? I will start, we can start a poll, but I'm going to keep it very short, because we're running out of time. So, we'll skip the poll, but you can see, okay, we do have the poll. You can choose, and we have the answer there for you. So, I guess we can skip this poll. We'll end this poll. So, yes, you can see how increasing the numerator increases the ratio. So, when the numerator increases, the ratio will increase.

Similarly, conversely, I should say, if you increase the denominator, what's going to happen to the, um, overall ratio? Yes, it decreases. So, when the numerator is less than the denominator, the ratio is less than one. When the denominator increases, the ratio decreases. We hope you now have a better understanding of how ratios work as multidimensional measures. They can be used in analyses of any kind by condensing multiple measures into one value, providing context for single dimensional measures, such as holdings, and establishing benchmarks or targets for these measures. We also hope you've learned some ratios specific to collection analysis, notably the use factor, providing context for the distribution of circulations based on the holdings. Ratio of borrowings to holdings comparing need to what is available, holdings, and the holdings factor, which could provide a benchmark for supporting disciplines. The goal of all of these is to provide greater insight into the measures used for understanding our collections. Thank you very much for participating in this session. We encourage you to use the discussion guide to think about what these ratios mean and how they can be used for making collections decisions. We hope you have some questions for us, but in the meantime, you can use the raise your hand feature if you're currently using or plan to use collection ratios like this.

>> SPEAKER: Thank you, Karen and Janette. That was wonderful. People can use the raise their hand feature, like Karen prompted, or pose questions using the general chat questions box. We have about three minutes for questions, so please feel welcome to share.

>> SPEAKER: Well, I'm not sure. I don't know how to see everybody's raised hand, so I don't know. Oh, we got somebody typing. That's good. I sort of feel like a radio host. There we go. Okay, we

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got some confirmation that it'll be passed on. That'll be good. I'm hoping some collections folks are listening.

>> SPEAKER: It looks like we have another question coming in.

>> SPEAKER: That's good. I wasn't sure if this would be a little too simple for some people given that it's sometimes considered basic mathematics, but I think it's a different way of looking at it. What type of analysis have you found to be most useful in your system? Um, I think the three key measures that we went over have been very important for us. The holdings factor, all three of these we've used. The ratio borrowings to holdings has been particularly useful. Which ratios do you find most often for making an argument for more collections dollars? Well, we, of course, um, I think the holdings factor is a big one, because that demonstrates either, especially when compared with others, if you average out the holdings factors for all collections, you will find they are almost always higher than one. So, that's good, but what we do is we, okay, that's the average, now what's far from average, and what's particularly well below average, those are the ones we would look for for use for more money.

>> SPEAKER: Well, thank you Karen and Janette. It looks like we have some nice compliments coming in in the chat window. If anyone has anymore questions, they're welcome to use the online forum, which will be available on Karen and Janette's session page on the ALCTS website. Thank you.

>> SPEAKER: Thank you.