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Contingent teaching through low-tech audience response systems: Using Plickers to support student learning and assessment

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Abstract

For one-shot instruction sessions, formative assessment is the most feasible method for gathering data to aid contingent teaching, the practice of adapting to learners' needs. Various technologies aid in the quick and efficient gathering of data on student learning in the classroom that can be used for formative assessment. Outside of a library teaching space or computer classroom, it is difficult to know what technology is available, what technology students can access, and how best to aid data collection that engages students, provides meaningful data to allow for contingent teaching, and is not dependent on student technology ownership. A low-tech audience response system has provided an opportunity to collect data on student learning and enable contingent teaching. This project report contributes to the field of information literacy research describing how a low-tech audience response system supports contingent teaching and innovates practice in different classroom situations.

Keywords

audience response systems; formative assessment; information literacy; USA

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1. Introduction

For teaching librarians, the question of how best to teach students based on their needs is a challenging one, particularly when teaching critical elements of information literacy (IL). In its introduction, the *Framework for Information Literacy for Higher Education* (Association of College and Research Libraries (ACRL), 2015) states that it is intended to open new pathways for librarians to think about instruction and its connection to student success. Teaching librarians strive to connect information literacy instruction to student success. However, if librarians are not mindful of their teaching, then students will not be as successful as they could be. This is where contingent teaching in instruction is vitally important. Contingent teaching is a technique by which instruction is determined by a student's level of knowledge, so that the teacher adapts as they move through a session to meet the learner's needs (van de Pol, Volman & Beishuizen, 2011). This practice aligns with the overarching goals of the ACRL

Framework in allowing librarians to adapt their teaching in the moment thus leading to improved student learning, connecting information literacy instruction with student success. With that feedback narrative, teaching librarians can ensure their instruction is as effective as possible.

Information to inform contingent teaching is most often gathered through formative assessment where data on student learning is also collected, one of the most viable options for librarians especially in one- or two-shot sessions. Student learning data can drive classroom practice both in real time and in future classes and when used for formative assessment, can be used as immediate feedback for students. It is effective; a meta-analysis of educational interventions found that formative assessment is a technique that has a large effect size, meaning it makes a significant difference in student outcomes (Hattie, 2009). Combined with active learning, which has also been proven a best practice and highly effective on student outcomes (S. Freeman et al., 2014; Michael, 2006; Prince, 2004), formative assessment increases student engagement and provides substantive data for librarians to practice contingent teaching that allows for improvement and tailoring of their teaching.

Any method or technology used in collecting student data is only as good as its content. Data collection must begin with thoughtful and well written questions that effectively solicit the data desired by the instructor. This is paramount for success. There are many options for collecting student data that can be used to inform contingent teaching and/or as formative assessments if shared with students, but each comes with a downside in the variety of teaching situations in which librarians find themselves. For example, pre-tests are a good way to discern student knowledge and tailor instruction prior to class (Kelly, 2019; Lazarowitz & Lieb, 2006) but pre-tests are not always an option due to time constraints or faculty buy-in. If a librarian is not in a computer classroom, they can use a low-tech option, such as one-minute papers. But compiling data by hand is time consuming, especially if it is a large class and, because data is often analysed after class, does not allow for contingent teaching. Students can raise their hands but that favours outgoing students and does not provide a true measure of student knowledge. Research has shown students tend to herd and vote with the majority, and some are hesitant to show their ignorance in front of the entire class (M. Freeman, Blayney & Ginns, 2006; Levy, Yardley & Zeckhauser, 2017; Stowell, Oldham & Bennett, 2010). Librarians can deploy technology, such as online polls or clickers (also known as audience response systems (ARS)). However, this does not solve other problems such as clickers not being available for a given class, or students forgetting or not owning a laptop or smartphone. Additionally, asking students to use their mobile devices can lead to connectivity and distraction issues (Stowell, 2015). Outside of a library teaching space or computer classroom, it can be difficult to know what technology is available to students on a classroom and individual level.

To address these issues, the authors sought an active-learning formative assessment mechanism that would answer the question: How best to deliver an assessment that engages all students, provides meaningful data to promote contingent teaching, and is not dependent on student technology ownership? In this case, the authors decided to utilise a low-tech audience response system, Plickers (https://www.plickers.com), a free (up to 63 students) program that only requires technology on the instructor's side, specifically a computer and a mobile phone. There are no technology requirements for students. This project report provides case studies on the use and assessment of Plickers from three distinct teaching scenarios and student levels: a large, undergraduate class; a professional, graduate programme; and a small, elective, upper-level class. Plickers serves as a low-tech response to a formative assessment need to inform contingent teaching.

2. Literature review

Plickers occupies the same teaching technology category as audience response systems (i.e., clickers). Clickers, and audience response systems in general, hold a large footprint in both education and information literacy literature. However, there have been few randomised controlled trials so it is difficult to draw any definite evidence-based conclusions about their effectiveness (Schneider & Preckel, 2017; Wentao, Jinyu & Zhonggen, 2017). There is conflicting evidence on the effectiveness of clickers on student learning gains with some research asserting there is an impact (Baumann, Marchetti & Soltoff, 2015; Bojinova & Oigara, 2013; Lantz & Stawiski, 2014; Zhonggen, 2017). Others find little to no difference in student learning through the use of clickers (Anderson et al., 2018; Caldwell, 2007; Dill, 2008; Gebru, Phelps & Wulfsburg, 2012; Hudson, McGowan & Smith, 2011; Moniz et al., 2010; Stowell, 2015; K. Walker & Pearce, 2014; R. J. Walker et al., 2018). The studies that do show an impact often are comparing clickers, an active learning technique, to a traditional lecture (Chien, Chang & Chang, 2016; Hunsu, Adesope & Bayly, 2016).

There are multiple studies which assert that clickers do have an effect, sometimes statistically significantly so, in areas such as student engagement and as an active learning technique (Blasco-Arcas, Buil, Hernández-Ortega & Sese, 2013; Caldwell, 2007; Funnell, 2017; Hunsu, Adesope & Bayly, 2016; Kay & LeSage, 2009; Rana & Dwivedi, 2017). Multiple studies show that students are satisfied with clickers, sometimes more so than with other teaching pedagogies, including other active learning techniques (Bojinova & Oigara, 2013; Chan & Knight, 2010; Hoffman, 2007; Hoffman & Goodwin, 2006; Keogh & Wang, 2010; Rana & Dwivedi, 2016; Ulbig, 2016; R. J. Walker et al., 2018). Graham, Tripp, Seawright & Joeckel (2007) found student perceptions were more positive when using the technology for formative feedback (empowering) versus for grading or attendance (compelling). Graham et al. also found a positive impact on what they call ‘reluctant participators’, the students least likely to participate in class under normal circumstances.

Instructors use clickers in a variety of ways in their teaching. Lantz (2010) outlines the ways in which they can be used in teaching. Cheung, Wan & Chan (2018) lay out the factors for successful adoption including knowledge of and teacher enjoyment of the technology. It is common to use them to encourage student engagement (Burnett & Collins, 2007; Christensen & Eissinger, 2011; Dennis, Murphey & Rogers, 2011; Osterman, 2007).

Clickers have been used to facilitate contingent teaching, as a means of data gathering to customize instruction (Julian & Benson, 2008; Osterman, 2007). Beatty, Leonard, Gerace and Dufresne (2006) discuss using audience response systems to teach science using a Question Driven Instruction (QDI) approach. QDI is an enhancement of contingent teaching where the audience response system question cycle organises classroom instruction and replaces a ‘transmit and test’ method with an iterative process of questioning, answer deliberation and discussion (Beatty et al., 2006). Stewart and Stewart (2013) build off Beatty et al. in a statistics class, implementing clickers to meet student needs as well as drive instructor decision-making. They have been deployed in large classrooms to gauge student comprehension of content, so that the instructor knows when to pause the lecture and address confusion (Dong, Hwang, Shadiev & Chen, 2017). They have been used by librarians as a check of prior knowledge and as pre-/post-tests (Burkhardt & Cohen, 2012; Deleo, Eichenholtz & Sosin, 2009).

As for Plickers themselves, the literature is more limited, especially in the context of contingent teaching. A 2018 article indicates Plickers works similarly to other audience response systems as a way to increase student participation (Elmahdi, Al-Hattami & Fawzi, 2018). The only articles in the information literacy literature are notes describing the technology (Byrne, 2014; Pashkova-Balkenhol & Free, 2015). In the wider educational literature, Plickers have been discussed in the context of physical education (Chng & Gurvitch, 2018; Krause, O’Neil &

Dauenhauer, 2017) and as a way to accommodate students with disabilities (Mahoney & Hall, 2017).

3. About the software

As mentioned, contingent teaching is a technique where instruction is informed by a student's level of knowledge, so that the teacher adapts as they move through a session to meet the learner's needs (van de Pol, Volman & Beishuizen, 2011). Most often formative assessment provides the data necessary to inform instruction changes based on student needs. In the classroom, this becomes a series of actions and decisions, which progressively inform the flow of the instruction. See Figure 1 for a flowchart visualisation of this process. This project report sought to use a low-tech audience response software, Plickers, to practise contingent teaching. Note, the study was deemed exempt by the university's Institutional Research Board.

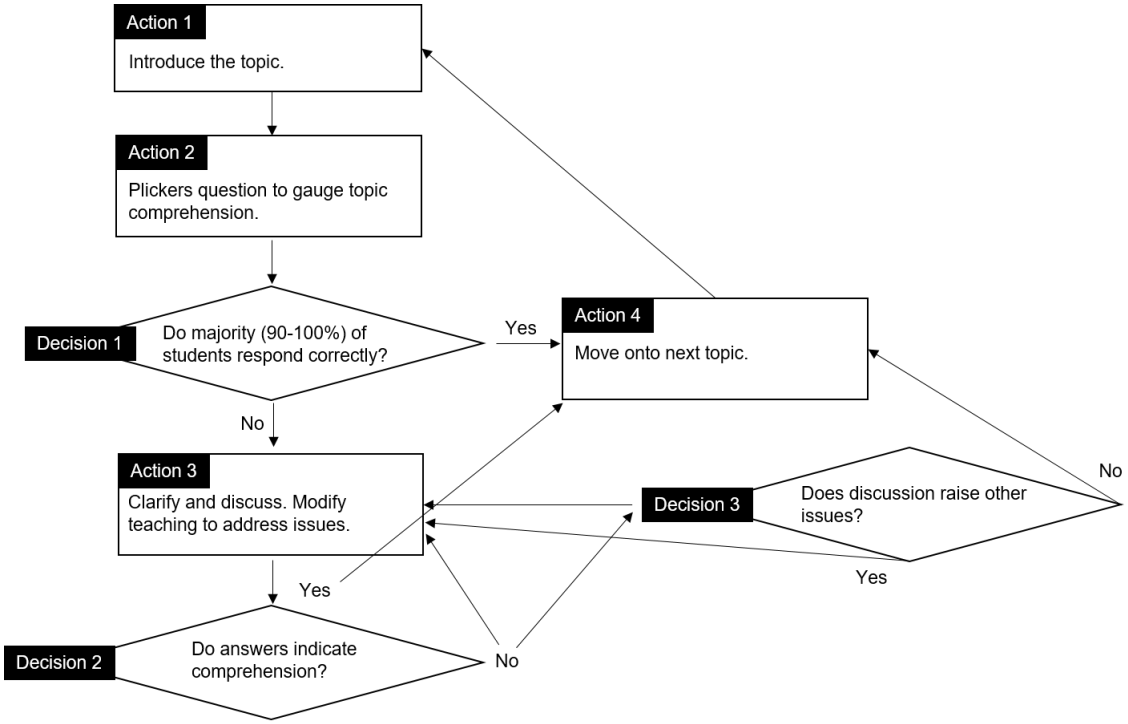

Figure 1: Contingent teaching flow chart

As stated, Plickers is a free (up to 63 students) program that only requires technology on the instructor's side, specifically a computer and a mobile (cell) phone. The computer is really only necessary if the librarian wants the class to see the correct responses and compiled results during class. If there is no computer in the classroom, the data also appears via the Plickers app so the librarian can practise contingent teaching. It is easy to set up, especially if there is an existing bank of questions to draw from. The steps to get started are: one, create an account online; two, download the Plickers app onto a phone or tablet; and three, populate a question library. From there, create classes that contain queues of different questions created from the question library. For a class, it is necessary to create a list of students. Important for course embedded library instruction where the librarian may not know or may not want to record student names, the student list can be anonymous and automatically generated with virtually no effort. For example, Student1, Student2, etc. All three case studies discussed in this paper used the anonymous option. The final step is to print the Plickers cards (see Figure 2), which students will use to answer questions. These cards come in multiple varieties: standard (40 cards, 2 cards per sheet) for average sized classrooms; expanded (63 cards, 2 per sheet) for

groups in a normal classroom setting; large font (40 cards, 2 per sheet); and large cards (63 cards, 1 per sheet) for larger classrooms.

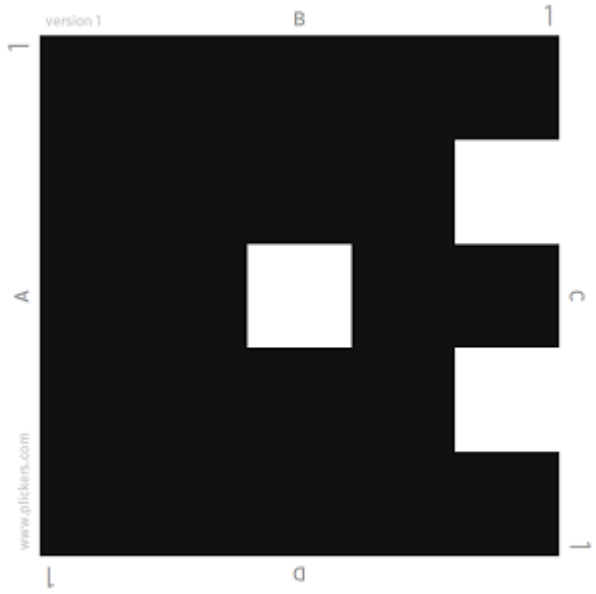

Figure 2: Plickers card

As shown in Figure 2, the cards are identified by numbers and have A, B, C, and D around the four sides. Students hold the card with their answer (A, B, C, or D) at the top. The librarian brings up the Plickers app on their phone, loads the question, then scans the student cards by panning their phone camera across the room of Plickers cards. See Figure 3 for an example question loaded on a phone, ready to begin scanning cards. The answers populate immediately on the Plickers website, so the librarian can instantly show how students answered and modify their teaching based on responses.

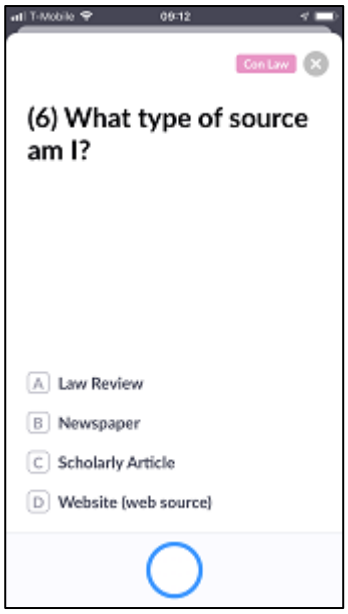

Figure 3: Plickers question loaded on mobile phone

4. Method

The authors implemented the low-tech audience response mechanism in several different pedagogical situations: a large undergraduate business class; a small, upper-level undergraduate elective course in Political Science; and in a graduate professional Dentistry programme.

4.1 Large undergraduate class

In a large, undergraduate business class, a semester-length project has teams of students conduct market research, decide how the company must change their operations in order to support the project, and determine the financial feasibility of pursuing the proposal. This is a research-intensive project. Students attend a two-hour and fifteen-minute information literacy workshop designed with the project in mind. The content provided for the workshop is dense due to the breadth of the project. For this reason, one of the goals is to help students begin to think strategically about where they might find different types of information during their research for this project. This helps students develop the knowledge practice of matching information needs and search strategies to appropriate search tools as outlined in the ACRL (2015) *Framework for Information Literacy for Higher Education* under the frame 'Searching as strategic exploration'. In addition, the librarian wanted to provide students' formative assessment data for them to learn the effectiveness of their current search strategies. Using the Plickers technology allows students to see what strategies many of them first thought to use, facilitating discussion around the best search strategies depending on their information need. It creates the space for students to realise that their existing strategies may not be as effective and that there may be a better way to find information. The students reflected on these search strategies using an instructor-provided worksheet.

The data facilitated contingent teaching by immediately indicating where the librarian should spend more time to course correct student search strategies during discussion. It also provides moments to boost student confidence for research skills developed during scaffolded instruction in their first two years in college. Additionally, considering the dense nature of the content, the librarian wanted a way to bring students' attention back to the instruction.

Using Plickers, the librarian inserted an activity throughout the workshop where students had to choose the resource they would search first to find different resources. This activity was the start for every new type of information search. Figure 4 outlines the handout provided to students when considering their answers. The exercise proved to be successful in helping direct the content covered during the workshop as well as being able to bring student attention back to the topic at hand. (See Table 2 for a summary of the data.)

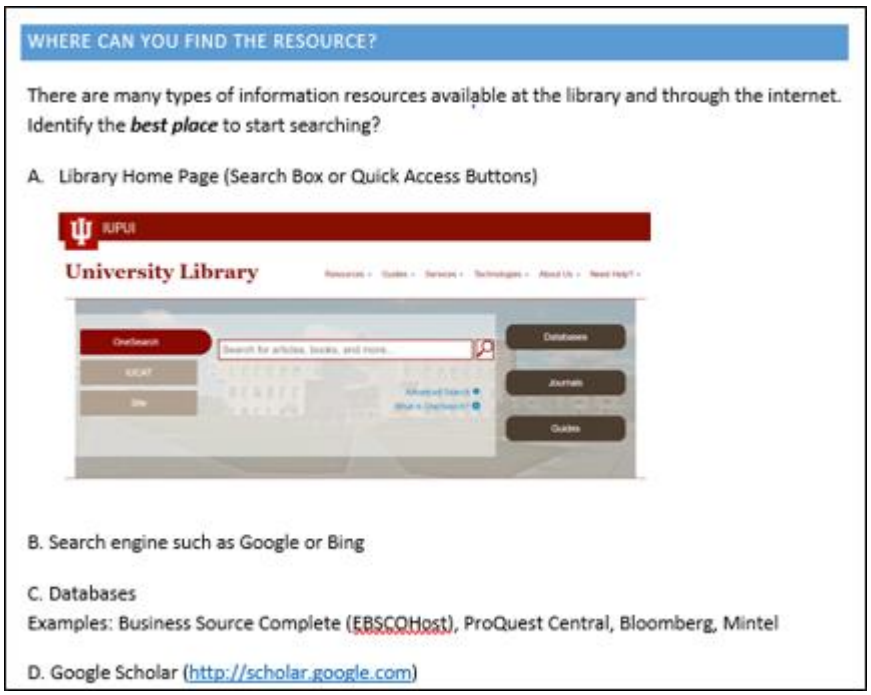

Figure 4: Plickers question handout for large undergraduate business class

4.2 Professional programme: graduate students

In a professional programme, first-year graduate students in Dentistry, D1s, begin their coursework with an introductory, modular course covering a variety of professional issues in dentistry including a course on evidence-based dentistry (EBD). The EBD course includes elements of advanced information and health literacy. Information literacy learning outcomes for the course focus on the ACRL (2015) frame 'Searching as strategic exploration' and state that students should be able to:

1. Select appropriate search terms (including Medical Subject Headings (MeSH) terms) to search;
2. Use search strategies (including filters and advanced search tools) that are relevant to the health science question;
3. Modify and refine search results;
4. Select resources with relevant content to answer health science questions.

The librarian used Plickers in the two-hour module session that focuses on advanced PubMed searching. Due to the large class size, students were instructed to work in pairs to respond to questions. The session began with a trivia question to introduce students to Plickers use. Other questions tested students' knowledge of searching including constructing searches and identifying types of resources as well as elements of PubMed that students should become familiar with, if not so already. (See Table 3 for a summary of response data. See appendix for questions.)

4.3 Upper-level elective, smaller undergraduate class

In the social sciences, information literacy may be scattered, not scaffolded, throughout the curriculum due to a range of courses and electives that are not taken in sequence. This presents a challenge for tailoring instruction as the librarian cannot assume the level of knowledge. The upper-level political science elective has very specific learning outcomes related to the ACRL (2015) frame 'Authority is constructed and contextual'. Students need to be able to recognise and evaluate various types of information sources (law review, scholarly articles, court case, etc.) and discern when it is appropriate to use the different source types. In

the 75-minute one-shot session students are shown different source types and have to identify what type of source it is followed by a discussion of when and how this source type might be used in the course assignment. In the last few minutes, the librarian demonstrates searching legal databases. (See Table 1 for a class outline.)

Table 1: Outline of upper-level class (Fall 2018)

1.	Introduction	What we'll be doing during the session. 1. Identifying and evaluating sources. (60 minutes) 2. Searching legal databases. (15 minutes)
2.	Teaching Strategy 1	Plickers question: What type of source is this?
3.	Comprehension Check	Ask for a volunteer to explain why they answered as they did for the different source types.
4.	Discussion	What was misleading about the source format/presentation? When and how might you use this type of source in your research paper?
5.	Repeat steps 2-4 for four additional sources.	
6.	Teaching Strategy 2	Demo legal databases with emphasis on finding case law.
7.	Closing	Reiterate learning objectives.

5. Results

With many audience response systems, including Plickers, student responses, with the correct response if there is one, are instantly available allowing the librarian to practise contingent teaching. Students are also able to see the results, providing an opportunity for formative feedback. Response data is also stored on the Plickers site, so the librarian can review and aggregate data at a later date. Tables 2-4 summarise student response data for each case study. In all tables, N does not necessarily reflect the actual number of students as student participation varied between questions and sometimes there were difficulties properly scanning response sheets. See appendix for complete professional programme questions.

Table 2: Large, undergraduate business class (Spring & Summer 2018)

Total	N	Correct*	% Correct	A: Catalog/ Library Website	B: Google	C: Databases	D: Google Scholar
Books	103	70	68%	70	9	5	19
Datasets	104	92	88%	6	24	68	6
Specific Journal	96	24	25%	24	12	49	11
Scholarly Journal Articles	97	97	100%	7	0	40	50
Newspaper Articles	97	11	11%	45	36	11	5
Total	**N**	**Correct***	**%**	**A: Catalog/**	**B:**	**C:**	**D: Google**

			Correct	Library Website	Google	Databases	Scholar
Trade Publication Articles	97	44	45%	27	12	44	14
Trade Association Statistics & Data	38	4	11%	2	4	32	0
Market Research	91	62	68%	8	10	62	11
Current Event	79	73	92%	2	69	4	4

*Correct indicates the number of students who choose an optimal strategy. Some resources have more than one optimal strategy.

Table 3: Professional programme – Evidence-Based Dentistry (Summer 2018)

What is NOT part of the Dentistry Library's Collection		Which type of resource would you NOT find in a PubMed search?		Which search would you use?	
N	% Correct	N	% Correct	N	% Correct
35	20%	33	82%	27	74%

Table 4: Upper-level Political Science elective (Fall 2018)

	Plickers (Fall 2018)			Online Polling Software (Fall 2017)		
Source Type	**N**	**Correct**	**% Correct**	**N**	**Correct**	**% Correct**
Law Review Article	23	23	100%	18	11	61%
Scholarly Journal Article	23	20	87%	12	12	100%
Court Case	20	15	75%	20	20	100%
Newspaper Article	19	7	37%	22	20	91%
Think Tank Report	23	0	0%	16	3	19%

In all classes, it only took a few minutes to hand out the Plickers cards, and a quick explanation of the system was all that was necessary for students to understand how to respond. Consistent with research, which indicates audience response systems combat student conformity and unwillingness to participate (Stowell, Oldham & Bennett, 2010), the authors noticed a wider variety of responses when using Plickers than with other low-tech methods, such as raising hands, or holding up coloured cards.

For both the large, undergraduate business class and the professional programme, Plickers data replaced less formal assessment methods, such as raised hands, so rigorous pre-/post-Plickers assessment data is not available. Anecdotally, in the business course, the librarian found Plickers questions enabled students to develop new search strategies, expanding their research strategy horizons, as evidenced by their work in assignments later in the course. The dentistry librarian noticed that students better retained information communicated using Plickers

in later sessions. In the upper-level political science elective class, the librarian did have polling software data from a previous semester, but differences between student cohorts makes comparison difficult (see Table 4). The librarian noted, however, that in previous, pre-Plickers semesters, students raising their hands to identify sources indicated that almost all students knew the source types.

In all cases, the authors practiced contingent teaching, modifying their instruction in the moment, based on student responses (see Figure 1). If student Plickers responses indicated they clearly understood a concept, the librarian moved on to other topics. If there was a low-percentage of correct responses, the librarian spent more time on the topic, engaging students in discussion of the concept and their answers. This student reflection allowed for formative assessment. Having students justify their answers is a best practice for student learning as it encourages critical thinking through discussions of why they chose that answer as well as learning from their peers (Chien, Chang & Chang, 2016).

6. Discussion

Librarians regularly find themselves teaching in situations where there is significant variation in student ability with information literacy and research skills, including within degree cohorts, or where they do not know students' information literacy levels. Students at all levels often assume they have knowledge and experience that they actually do not. Kruger and Dunning (1999) showed that a lack of awareness of one's skills led to overconfidence. Students are prone to overestimate their information literacy and research skills and are unlikely to seek assistance (Geffert & Christensen, 1998; Gross & Latham, 2007; Gross & Latham, 2012; Molteni & Chan, 2015; Schilling & Applegate, 2012). A systematic review of the literature showed this to more often be the case with undergraduate, rather than graduate, students (Mahmood, 2016) although Langendyk (2006) showed that underachieving medical students generally scored themselves, as well as peers, generously in self and peer assessments. This overconfidence leads some not to pay attention in information literacy sessions. Plickers proved useful in making students focus on topics of importance and may help them identify deficiencies in their own knowledge in a low-stakes formative assessment environment.

In all cases, students were receptive of the activity. Some commented on the 'game we played' in end of workshop assessments, finding the technology of using and scanning cards interesting. In larger classes, control of a Plickers sheet became something of a reward to early arriving students. Using this low-tech response system also limited problems, which can arise when students look down at their phones to answer a poll. They can become distracted or have difficulty logging into the technology (Stowell, 2015). This problem is evident in the response rate between Plickers and online polling software in the upper-level political science elective course. While the number of Plickers responses was consistent (ranging from n=19 to n=23), the response rates to the online polling software declined with each question asked (n=22, 20, 18, 16, 12) (see Table 4). Asking students to raise Plickers cards visible to the entire class benefits from peer pressure that is not present when they are asked to complete a poll via their phone. Lowered heads tapping responses into a phone may not equal engagement with the poll, since there are so many other distractions available on their phones (Hazelrigg, 2019). These concerns are not an issue with Plickers, since the only person managing the technology is the librarian. Additionally, since each Plickers card is an individual code, students had to provide their best answer without relying on their peers. Since cards are not distinctive and it is not possible to know how fellow students are responding, the technology is superior to other low-tech assessments, such as raising coloured cards (or hands), which can lead to a herd mentality (Levy, Yardley & Zeckhauser, 2017), where students see what colour others raise and quickly change their answers.

Overall, the authors found Plickers were successful for gathering data with which to practise contingent teaching that also engaged students in formative assessment. Nevertheless, there are logistical issues to consider. The free Plickers pack contains a maximum of 63 cards, if the class size exceeds the pack, then the librarian must develop alternatives, such as grouping students into pairs. This approach increases the amount of time needed for students to answer questions, however, it harnesses the power of peer interaction through high-impact assessment activities such as think/pair/share (Hattie, 2009). Classroom configuration is another possible logistical issue: if a classroom is too deep, wide or densely packed it can be challenging for the instructor's phone to record all responses. The system inevitably misses at least a few cards, which is fine for larger and/or anonymous classes but may be problematic for others.

7. Conclusion

Plickers solves many of the problems associated with clickers or other audience response systems, such as student access to technology, cost, and technical glitches. One major limitation with many audience response systems, Plickers included, is that it is only possible to ask multiple-choice questions, which are not appropriate or desirable for every situation. Should other teaching librarians want to start incorporating low-tech data gathering and assessment through Plickers into their instruction, one important point to keep in mind is that the questions are more important than the technology, as poorly written questions will hinder the collection of meaningful, actionable data. Referring to resources to help write good multiple-choice questions is advised (for example, Agee, 2016; Bruff, 2009).

Of course, using Plickers to gather data for formative assessment, or to practise contingent teaching is dependent on the teaching librarian feeling comfortable enough with the material and their teaching to modify instruction in the moment. This is challenging. Research has shown that teachers are better at understanding student levels from formative assessment data than they are at deciding what to teach next based on that assessment data (Heritage, Kim, Vendlinski & Herman, 2009). Andersson and Palm (2017) found that professional development can help teachers to implement strategies that strengthen formative assessment based on identifying student needs and modifying their teaching. However, they found these developments would require major changes in most teachers' practice. Being prepared for different evidence as well as being ready to make immediate changes in instruction takes time and experience (Popham, 2011). Popham's (2011, p. 50) five choice-points highlight the challenge: One, what kind of assessment tool to use; two, when to collect it; three, how many items to include in the assessment; four, when to make an instructional adjustment; and five, what kind of adjustment to make. While challenging, practising contingent teaching is vital to student success that allows librarians to build a narrative of the impact of librarians embedded into the ACRL Framework (2015).

As this project report demonstrates, students in a variety of disciplines and grade levels benefit from the use of Plickers in library instruction. The nature of Plickers turns the challenges of the herd mentality (Levy, Yardley & Zeckhauser, 2017) into a benefit with students standing out if they do not participate while keeping their responses private. Anecdotally, the authors find that graduate students are sometimes reluctant to participate in 'fun' activities. However, in these case studies at least, graduate students enjoyed using Plickers as much as undergraduate students. Plickers are engaging but integrate into the flow of class and do not come across as 'busy work' which some upper-level students perceive active learning activities to be (Welsh, 2012; Wolter, Lundeberg, Kang & Herreid, 2011). Because students are largely familiar with the concept of audience response systems and many have used clickers, they are responsive to the technology and catch on quickly. However, because Plickers are a unique twist on the technology, student interest is maintained more so than other interactive options. Importantly, Plickers do not draw attention to students who lack the necessary technology, or may have technology accessibility limitations, and can be implemented in almost any type of classroom.

Plickers are an innovative, low-tech way to engage students as well as practise contingent teaching, collecting formative assessment data to improve teaching and student performance.

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Appendix

Evidence-Based Dentistry graduate professional programme questions

1. What is NOT part of the Dentistry Library's collection?
    a. A key to the city for Roanoke, VA
    b. A bowl made from a human skull
    c. A sperm whale tooth
    d. An early prototype tube of Crest toothpaste mistakenly labelled "Crust Toothpaste"
2. Which type of resource would you NOT find in a PubMed search?
    a. A conference proceeding from a meeting of a clinical professional organization
    b. An editorial published in a peer reviewed medical journal
    c. An undergraduate senior thesis on a biomedical topic published in a university online repository
    d. Report of a Phase IV clinical trial from an independent laboratory with FDA funding
3. Which search would you use?
    a. Is trazadone or alpha lipoic acid better at treating burning mouth syndrome
    b. Burning Mouth Syndrome AND Trazadone AND Alpha Lipoic Acid
    c. Burning Mouth Syndrome AND Trazadone OR Alpha Lipoic Acid
    d. Burning Mouth Syndrome AND Trazadone VS Alpha Lipoic Acid

*B & C are both correct answers.