2016

Making Lexia® Work: A Backward Design Approach to Helping Teachers Utilize Technology

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Abstract

If a teacher were to give her students an unfamiliar piece of technology and walk away, leaving the student to puzzle out the best way to utilize it, we would rightly consider such actions to constitute bad teaching practices. However, these types of practices are common when it comes to introducing new techniques and materials to teachers, especially in the domain of educational technology. This action research investigation applied solid teaching practices to the task of improving the delivery of *Lexia* reading software, a computer aided instruction (CAI) program, in middle and secondary special education classes.

Special educators have a unique set of responsibilities and challenges both in and out of the classroom. Instead of being given one more thing to do, they need the opportunity to utilize a technology with the potential to make their practices more efficient and effective. This research used qualitative and quantitative data to not only give teachers the technological ability to allow their students efficient use of the software, but to give teachers a better understanding of how CAI fits with their academic and classroom management goals.

Keywords: computer aided instruction, professional development, backward design, action research

Making Lexia Work: A Backward Design Approach to Helping Teachers Utilize Technology

It has been said that "teachers make the worst students." While there might be some truth to this (I've known teachers to post on Facebook and shop Amazon while attending workshops) it is also worth noting that teachers are not always given the benefit of all the good teaching practices they are themselves expected to utilize; teachers might take a class to study experiential learning for which the expectations are to read a text and post to a discussion board. Special education teachers learn all about the paperwork aspects of postsecondary planning, but never meet with military recruiters, job coaches, or group home administrators. Most relevant to this work, we ask teachers to teach students for understanding, but when it comes time to introduce new learning to teachers, we think it sufficient merely to give them access to relevant information. Applying what we know of good teaching practices to the professional development of teachers will reap huge benefits for our educators and the students they service.

Literature Review

One such important benefit might be to student reading gains. More than most other factors, reading skill in children is highly predictive of success in secondary school (Learning Point Associates, 2004). Conversely, low reading achievement is correlative with failure and drop-out. Students with learning disabilities represent a high proportion of low readers and their time spent in high school can be especially painful, as the gap between their abilities and the demands of grade-level texts become impossibly wide. As reforms to increase rigor and implement standards-based systems for high school graduates take away from the time and energy that can be devoted to remedial skill instruction, the creators of computer assisted

instruction (CAI) programs promise software with the ability to diagnose and target student needs to produce time and resource-efficient learning activities for struggling students (Doe, 2008). Rosetta Stone produces one such CAI called *Lexia,* which has been utilized by middle and high school special education students in MSAD #17 since the 2014-15 school year and will continue, at least through the 2016-17 school year.

Lexia software was chosen by MSAD #17 administration and teachers based on the comprehensive nature of the program. *Lexia* covers multiple reading skills rather than focusing on a single skill, such as vocabulary. *Lexia* software was thought to be a good fit with the district's current model for delivery of special education services. Essential skills development classes are populated with students with various academic and developmental strengths and weaknesses. Therefore, a program was needed that combined small group, one-on-one, and independent, self-paced work and had a track record of positive results.

The first year of implementation yielded mixed results. The author's caseload of five students made dramatic gains in their reading ability based on spring to spring scores. His special education students, who regularly utilized *Lexia Strategies* software in addition to regular education instruction and interventions, averaged over two years of growth in reading ability on STAR testing. During the 2015-16 school year, the author's students averaged well over two grade levels growth. However, when all mainstreamed special education students were examined under the same criteria, students gained a disappointing 0.31 grade levels in reading ability. Students were not using the software or not using it effectively. Further investigation proved that many students were spending almost no time accessing the software. Although teachers devoted regular class time for students to log in and receive instruction, individual account data from the

website indicated that many students had spend a minimal amount of time logged in to the software over the course of the year. Of 42 students placed in the mainstream who received special education services and had remedial reading goals, 30 students completed less than 90 units or less than 1 unit per class; 13 of those students completed less than 10 units over the course of the entire year. These numbers are cause for frustration. The effectiveness of the program cannot be effectively judged if the program is not utilized with fidelity. Furthermore, this data was the impetus for this investigation; an effective investigation had to examine and address the relative failure of the initiative, not merely quantify reading gains.

Like many educational initiatives, successful implementation of CAI goes beyond merely purchasing it. Not all CAI tools are created equal. Research, both quantitative and qualitative, indicates positive results from programs, such as *Lexia*, which supplement traditional, face-to-face instruction with a computer component; however other computer-based instruction programs have been rated less effective (Cheung & Slavin, 2013). Furthermore, measurable gains in reading comprehension can be made with peer tutoring, explicit teaching of metacognitive skills, and explicit teaching of reading comprehension; these activities have not been encapsulated into CAI, but can be orchestrated to dovetail nicely and should be considered options for a comprehensive reading program (Learning Point Associates 2004, Mastropieri & Scruggs, 1997; Mastropieri, Scruggs, & Graetz, 2003; Middleton 2009). Finally, to be successful, any intervention is dependent on the relationships between student and teacher, teacher and administrator, and teacher's ability to access and manipulate the intervention (Bolman & Deal, 2013). To be effective, CAI must be more than good, it must target the appropriate audience by being usable and appropriate.

Action research goes beyond examination. Rather than identify and quantify a problem, the current situation at Oxford Hills Comprehensive High School calls for a solution. By engaging in a collaborative and reflective process that integrates close observations of students with targeted professional development, teachers can more effectively use the tools at their disposal, including technology, to improve reading outcomes for our students.

Components of Effective Reading Instruction: Limitations of CAI

Indispensable aspects of taking an Understanding by Design (UbD) approach to training teachers in reading remediation much include an understanding of the limitations of CAI. Niederhauser and Stoddart (2001) caution against the notion "that something inherent in the technology will promote instructional reform." This supports the assertion that merely installing CAI on student laptops will not make them better readers. The act of reading encompasses multiple skills, from the ability to recognize phonemes and sight words at the basic level through the ability to access prior-learned knowledge and apply it to gain meaning from unfamiliar material. What compounds the problem of reading instruction for students with learning disabilities is that deficits may exist in one or more areas of cognitive functioning or academic achievement (Mastropieri & Scruggs, 1997). Such an imbalance of cognition and achievement makes a traditional progression through reading instruction inefficient and ineffective for a student with learning disabilities. A common problem among middle and high school students with learning disabilities is a low reading comprehension in spite of intact basic decoding skills. Furthermore, students who do not comprehend as well as their peers are less likely to read for pleasure, ultimately logging less time reading and falling further behind.

One reason that perpetually low readers never become proficient is for a lack of explicit instruction in comprehension skills (Learning Point Associates, 2004; Palumbo & Loicono, 2009; Mastropieri, Scruggs, & Graetz, 2003). At the secondary level, it has been found that some of these skills, such as vocabulary acquisition, are not necessarily taught in conjunction with reading, but as part of content classes. Although content-specific vocabulary may be learned, widening gaps in grade level vocabulary result in an eventual inability for struggling students to access grade level reading. Learning Point Associates (2004) recommended improving reading fluency in order to improve achievement; students in the study who struggled to read at a natural pace could not process the content of their reading at the same time that they were struggling to decode. Fluency drills in sight words have been shown to improve overall fluency. Mastropieri et al. (2003) recommend visual aids throughout the curriculum, not only to illustrate textual concepts, but to visually organize text, to color code related information, and to provide pneumonic devices to help students recall key vocabulary and concepts. *Lexia* software provides instruction in sight words.

Lack of background knowledge negatively impacts reading comprehension; for instance, a lack of knowledge of common metaphors or idioms can change the meaning of a passage for a student. (Palumbo & Loicono, 2009). Often, especially at the secondary level, background knowledge is assumed, and so, not taught explicitly. Other vital skills, such as metacognition, are also difficult to teach in a clear-cut fashion and do not necessarily fit the current iterations of CAI, at least, not as stand-alone instruction. Teachers who wish to utilize CAI must be aware of these potential gaps and not rely exclusively on software to develop all the skills necessary to develop students into proficient readers.

Effectiveness of CAI

In spite of potential shortcomings, the increasing sophistication of CAI coupled with the knowledge that CAI is just one component of a comprehensive reading remediation program promises optimistic results for efficient and effective instruction. Even as early as 2000, the results of studies indicated that CAI could effectively improve reading scores (Hall, Hughes, & Filbert, 2000). Sadly, much of the basic drudgery of reading instruction has changed little in the last hundred years. For example, letter and word recognition tasks, cloze activities, and fluency tasks have been time-tested activities for building reading skill and comprehension. Therefore, even the early iterations of CAI had little trouble repackaging such types of task-oriented instruction into a digital bundle that could be a colorful, interactive, and engaging way for students to build skills. One of the shortcomings of this type of instruction is its one-size-fits-all, linear nature. Robinson (2005) stated that evidence for student centered learning in reading instruction has existed for decades; however, instruction has remained largely uniform from student to student. As technology improves, CAI has the potential to be sophisticated enough to assess student strengths and weaknesses on the fly, adjusting instruction and choosing appropriate activities in moments rather than months (Doe, 2008). Such characteristics make it especially attractive to remediating high school students with disabilities. Such students are likely to have a range of reading levels and deficits in different sub-skills.

Both quantitative and qualitative research showed the potentially positive impact of *Lexia* software for students with reading difficulties. In a qualitative case study, Middleton (2009) used the software to remediate reading skills of a fifth grade girl with a specific learning disability. After intensive summer tutoring sessions, the student returned to school and completed the year

on the honor roll. She also improved her math achievement without outside tutoring and was able to build and maintain positive relationships with her teachers and other adults in her life. Although impossible to link all these successes to a reading instruction program, it would be tough to argue that success in one area can't trigger a ripple effect of positive changes in other academic and nonacademic areas. Cheung and Slavin (2013) conducted a meta-analysis of 20 prior studies on CAI. Although only one moderately sized study on *Lexia* fit the criteria of the study, it produced the single highest effect size of any program within the meta-analysis. As is true of most instructional materials, some do a better job than others.

Understanding *Lexia*: Getting Beyond Buy-In

The effectiveness of an intervention goes beyond the numbers produced in a clinical setting. Teacher and students must become invested and engaged in order to achieve the desired result (Bolman & Deal, 2013). Therefore the way a program is presented to those responsible for implementation is nearly as important as the quality of the program. In the school setting, Bolman and Deal (2013, p.230-1) caution against the top-down approach in which funding is appropriated for experimental teaching methods, the administration commits to the experimental approaches without faculty input, and resistance to change becomes an obstacle to initiating. In such cases, the initiative itself can transform into a political chip, sowing distrust and undoing any good that it may have done in the first place. Indeed, Michael Horn (2015), speaking specifically about *Lexia* software cautions that although teachers often worry primarily about software troubleshooting and getting themselves and students the ability to log in to the software, such an approach undermines understanding. Without a clear comprehension or big-picture understanding, teacher effectiveness and hence student gains can be compromised. The ability to

log on to the software, although thought of as an end, is just a small piece of effective utilization of any CAI.

Fortunately, Hall et al. (2000) found that teachers agreed that CAI can be effective, removing a potential obstacle to teacher buy-in for a CAI initiative. Teachers felt that the format of a CAI was aligned with or similar to the format of their classes. Many of the activities that teachers were doing in whole class or small group work sessions could be done through CAI. By utilizing the CAI platform, teachers saved the hassle of replicating materials for all students; students were able to self pace rather than learn material at the same pace as their classmates. According to Hall et al. (2000), teachers also felt that practice and assessment could be completed with CAI equally as well as pencil and paper assessments. Noting the increase in electronic assessment since the completion of this study, it would be difficult to argue this point. Many CAI, including *Lexia,* incorporate assessment into instruction. This improved convenience could be another selling point with teachers resistant to change.

Wiggins and McTighe (1998) found that meaningful learning takes place when students are taught for understanding. Understanding by Design (UbD) emphasized backward design; when planning instruction, teachers should start with the end in mind, then plan instruction that will bring students to that goal. By deemphasizing content-driven lessons, such practices can help teachers distill their curriculum down to that which is relevant and constructive, adding knowledge to students' perceptions of the world. Although often contextualized in the school setting with teachers designing curricula for their students, many of the concepts are applicable and appropriate for professional development of teachers as well. As some students do not achieve understanding simply by being exposed to content, it is reasonable to think that the same

might be true of teachers when learning to utilize new technologies in their classrooms. In the case of Oxford Hills special educators, a broad and comprehensive understanding of reading remediation, CAI, and available technology can lead to effective and efficient reading remediation. A key component of this action research was a focus on identifying the needs of teachers in the cohort and addressing them through carefully designed instruction.

Precedent exists for the application of backward design theory; Fuller (2000) found that improving teacher understanding of computer applications for students was a more effective and efficient use of coordinator time than working directly with students. These results were consistent with those of Niederhauser and Stoddart, who distinguished between drill and practice tutorial software and more open-ended educational software, but found that many teachers in their study did not make such distinctions and would benefit from a more thorough understanding of software choices from a purely pedagogical standpoint. Koehler and Punya (2005) examined the deliberate use of learning by design principles in three instances of faculty development. In all three examples, teachers were given instruction in the use of technology in the context of accomplishing an instructional goal such as creating a virtual tour of a school.

> The acquisition of skills approach does not address what we and others believe is a critical issue: that teachers need to develop pedagogical understandings if they are to integrate technology into their instructional practices in ways that will benefit students. Clearly, teacher change cannot be achieved merely through direct instruction. It requires teachers to experience, as learners, the kinds of novel learning environments that can facilitate and enhance learning through the appropriate use of technology. (Koehler & Punya 2005)

This approach validates a novel path forward with the problem of effectively implementing *Lexia* at Oxford Hills Comprehensive High School. Rather than teach skills-acquisition in this initiative and in future initiatives, the goal for teachers must be understanding. A big-picture comprehension can accomplish more than knowledge in isolation and ultimately benefit students through improved instruction.

Research Design

Purpose of the Research

As expensive, specialized hardware and software are replaced with affordable, sophisticated, application style software that can be run on home computers and tablets, the march to more CAI is inevitable. Despite the current shortcomings of CAI to improve metacognitive skills, background knowledge, and other tangential reading skills, they can address an ever-increasing portion of other skills to improve reading ability. Specifically, they can effectively and efficiently address many of the concrete skills that go into making a fluent and successful reader through drill and repeated practice. Implementation of CAI must be thoughtful and comprehensive, with well trained and knowledgeable teachers who seek to build on electronic instruction with scaffolding and complementary face to face instruction.

The purpose of the research is the development of staff to implement CAI. The focus of such development should be staff understanding and must mirror best teaching practices. In this context, *Lexia* becomes a useful and valued tool that complements and is complemented by more traditional means of instruction. Teachers and students who rightly did not value having another task to complete can be persuaded to engage fully with the tool in the context of improving reading ability and classroom productivity.

Research Questions:

This action research study was designed to address the following research questions when special education students in grades 9-12 are given instruction supported with *Lexia - strategies for older students:*

1. Can teacher implementation of this initiative be improved by applying understanding by design principles based on active, moment-to-moment data collection and theorizing to teacher-development efforts regarding the *Lexia* program?
2. According to teachers, what obstacles exist that keep students from fully benefitting from *Lexia* and other forms of computer aided instruction?
3. Did teacher understandings of *Lexia* software correspond with an improved student experience?

Central Concepts Related to the Investigation:

The central concepts related to the investigation were improving professional development and improving technology use in the classroom to increase both efficiency and effectiveness.

Although many high-quality practices and protocols exist for providing professional development to educators, too often teachers are given tools with little or no knowledge of their intended implementation. Although this conundrum predates the technology age, as evidenced by the nearly unused reading programs, still in their plastic wrap, that can be found on backroom bookshelves in schools around the state, certainly educational technology has exacerbated this problem, given the variable rates of technological fluency among teachers.

Unfortunately, such roadblocks prevent teachers and students from accessing tools with the potential to unlock substantial gains. With technology, teachers can deliver truly individualized instruction to students without a curriculum standing between them and their skills. The power of a teacher is multiplied by these circumstances. Students who would have required a separate placement can now learn alongside their peers.

General Approach of the Investigation:

In order to conduct this investigation, I utilized survey data from research participants to identify obstacles keeping students from engaging with the software. I crafted engaging and responsive instruction to improve instruction in the special education classrooms in the middle and high schools.

In the first stage of my investigation, I asked participants to complete a brief survey to gauge their comfort level dealing with the four facets of implementing CAI in their classrooms. I learned more about their perceptions of *Lexia* as well as their general classroom management preferences and integrated those into the next phase of my investigation.

The second stage utilized google classroom to deliver asynchronous instruction to the participants. The instruction took the form of interactive movies (educanon.com), videos constructed using screen casting software, and interactive tasks constructed by the investigator. Participants were asked to complete formative tasks related to their classroom practices.

The final phase of the investigation was comprised of another brief survey designed to measure growth since the pre-assessment in targeted areas. Using mixed methods enabled me to validate my quantifiable data with written testimony. This provided me with a clear picture of the

effectiveness of using backward design for the purposes of professional development. It also provided direction for future growth both for the study's participants and for the department as a whole.

Research Methods

Setting

I conducted my research in two schools in the Oxford Hills School District, Oxford Hills Middle School and Oxford Hills High School. Oxford Hills Middle School North Campus is located in South Paris, Maine; The middle school south campus is located in Oxford, Maine; Oxford Hills Comprehensive High Schools straddles the towns of South Paris and Norway. Access to the site is through my employment and with the approval of my superintendent.

MSAD #17 is one of the largest districts in the state measured in area and serves the eight towns of West Paris, Harrison, Hebron, Otisfield, Oxford, South Paris, Norway and Waterford. The most recent School Report Card rated Oxford Hills Comprehensive High School a "C," with student achievement scores slightly below state averages and graduation rates slightly above.

In order to graduate with a diploma, students at Oxford Hills Comprehensive High School must demonstrate proficiency in reading. Proficiency is currently measured by a student's ability to achieve a grade equivalence score of at least 8.0 on the district screening assessment, the STAR test. In order to improve student scores, students in the High School who score below the benchmark receive remedial literacy instruction from a mainstream teacher in addition to their regular English Language Arts class. This remedial instruction consists, almost exclusively, of fiction novel reading and practice. Therefore, this setting is appropriate for the use of

computer aided reading instruction focused on building basic reading skills; this focus will complement both the grade level ELA instruction and the remedial literacy instruction.

Sampling/Participants

The sampling was comprised of volunteer participants drawn from a pool of special education teachers in MSAD #17 who use *Lexia* software in their classrooms and self-identify as wanting to improve their delivery methods. Subjects were recruited through an email solicitation. Since the stated goal of the research is to provide development to improve participants' knowledge and teaching methods, the sampling should be appropriate to the task at hand, although not necessarily representative of special educators in the district or in general.

Methodology

The method of this study is an action research model. Whereas traditional research merely collects and measures data, action research studies solve the problem at hand. Specifically, this investigation addressed the relative failure of the initiative to this point. To investigate this while simultaneously attempting to solve the problems and steer the direction of the study, qualitative and quantitative data was collected at the start of the investigation through a survey form completed by participants. Participants completed the same survey at the end of the study to gauge progress and possibly suggest a direction for future development.

Operational Measures

Data was collected by survey prior to the instructional phase of the investigation and served as a pre-assessment to shape the first phase of instruction. The pre-assessment survey was designed to assess participants' current comfort levels with the skills necessary for optimal implementation. Successful use of computer aided instruction includes, but goes beyond the

technical knowledge necessary to use and possibly troubleshoot software; knowledge of learning disabilities, knowledge of the facets of reading instruction, effective classroom management, and above all an understanding of how to integrate computer aided instruction with current classroom practices. The survey was designed to isolate and assess participants' comfort levels with each of these skills as well as to promote self-reflection and awareness of these aspects of their classrooms.

Data Collection

Data was collected from participants via surveys completed using google forms. Participants completed a survey designed to assess their current abilities in the facets of instruction required for successful implementation of Lexia in their respective classrooms. Participants participated in asynchronous instruction via google classroom and were challenged to apply that instruction in their classrooms. Following five instructional tasks, participants took a post assessment, designed to gauge their progress over the course of the study.

Data Analysis

The data was analyzed using mixed methods. Quantitatively, scaled questions measured the teachers' self-assessment of their growth in specific skills over the course of the study. The use of identical pre and post assessments ensured an "apples to apples" comparison of the teachers' abilities in all four facets of implementation.

A qualitative analysis of short answer responses on the same assessments was used to corroborate the numbers attained in the quantitative analysis. Moreover, action research differs from traditional research in that it doesn't have a well-defined endpoint (Shagoury & Miller-Power 2012). Rather, it works as a continuum and is thus well-suited to the real world and

education in particular. Qualitative data will be particularly useful to continue improving our use of Lexia and other CAI beyond the scope of this investigation.

Expected Findings

As our students come to the table with varying levels of aptitude and knowledge, our teachers approach instruction from different starting points. However, a good teacher would never hand students a program and expect them to learn, while this practice is common when working with teachers; expensive programs are purchased and used improperly or not at all due to lack of effective professional development. What if we applied a highly effective teaching philosophy such as Understanding by Design to implement educational initiatives? Prior studies suggest that such an approach may be effective for professional development (Koehler & Punya 2005). I expected to find that teachers benefit from the same good teaching practices as their students. Moreover, providing instruction focused on understanding will improve conceptual awareness. Teachers will be able to make informed decisions about instruction and not simply rely on a scripted approach.

Potential Issues and Weaknesses

Recruitment could pose a significant barrier to the completion of this research; the promise of recertification hours may not be enticing enough to recruit a representative group of teachers. Rather, teachers who tend to participate in other opportunities will join this investigation. Such a dynamic could create an artificially high success rate. On the other hand, such a group could include many teachers who come to the table with pre-established mastery of the content.

In such circumstances, the challenge of the investigation will be similar to that of a teaching assignment. Tasks will have to be tailored so that remedial needs of participants are met while still providing challenge and enrichment for those at a more advanced level.

Last, due to the highly specific nature of the investigation, the applicability of the results outside of the schools studied would be imprudent. This action research investigation is designed to address a specific problem among specific teachers and is not generalizable. On the other hand, the broad idea of applying good teaching practices to teaching the teachers seems an obvious and universally applicable concept.

Research Narrative

From 2007 - 2011, I was employed at a small, isolated K-12 school. While the acronym "RTI" had already become common parlance, it did not become law until 2012. However, a desire to be out in front of the impending law led us to experiment with different models of intervention. In the high school, students who did not achieve at or above the 50th percentile in reading on achievement screenings were provided with a 20-minute block of remedial instruction. The English teacher (yes, there was only one) quickly found that the varied needs of the students who required remediation were overwhelming to manage in addition to her regular teaching duties. As a solution, she purchased several dozen *Lexia* licenses. Students spent the intervention block alternately using the software and receiving small group instruction. In less than a year, the entire high school, save one student with a profound cognitive disability, was reading at or above the 50th percentile.

Several years later, I found myself at my current employment, as a special education teacher at Oxford Hills Comprehensive High School. When the prospect of recommending remedial reading software to my administrators arose, I wholeheartedly endorsed *Lexia*, recalling my previous experience. When they accepted my recommendation and purchased 150 licenses, I volunteered to help roll out the initiative. That was in the fall of 2014. It would be perfect; I could research the effectiveness of the product and use my findings to complete my capstone project at the University of Maine Farmington; two birds with one stone.

Unfortunately, the rollout did not go as smoothly as planned. Department training time was sacrificed to what were considered to be more pressing matters and I admit that I took staff computer competency for granted. Simply supplying teachers with the available tutorials was not effective. I had planned to show off some of the more advanced aspects of the software; however, my peers struggled to install and run it on their own laptops and their students' and required time-consuming support to access what I considered to be rudimentary aspects of installing software and tracking student progress. As the year went on, it became apparent that what little amount of time and effort teachers were willing to put into the program at the roll-out was decreasing as the year went on. By the end of the year, many students had only logged a few minutes on the software, while only a few had made regular use of it. Teachers reported that they didn't have time and that the students didn't like using the software.

I dug a little deeper and looked at achievement data for my students as well as others throughout the high school. As stated in the introduction to this investigation, my students had all used *Lexia* software diligently, made corresponding gains and actually averaged more than two grade levels of growth according to the STAR achievement screening test. In contrast, students

with reading goals throughout the school gained, on average, a paltry .3 of a grade level. When cross-referenced with students' *Lexia* usage habits, there was an obvious correlation between students' completion of *Lexia* units and improved reading achievement. However, the task of getting other teachers onboard with the initiative was not apparent.

I had an "ah-ha" moment in the Spring of 2015, while attending professional development for IEP writing. We were learning about writing compliant transition goals; however, the focus was on the minutia, not the big picture. Rather than teach for a broad understanding of transition planning, we were being fed compliance-oriented word-smithing. I thought frustrated that in the best case scenario: we would leave that workshop with a checklist that would do little or nothing for student outcomes, but would make our district and state look better. However, I then recognized the parallels between this development and my own instruction to my peers during the *Lexia* rollout. Merely delivering the content would be considered an inadequate teaching practice if I was trying to give my students a new skill, and it was similarly inadequate in providing professional development. To be effective, this initiative needed to utilize technology to engage teachers, it needed to connect to prior learning and other ongoing initiatives, it needed to incorporate teacher needs rather than assume skills such as computer literacy, and mostly, it needed to be taught for understanding. Rather than providing a manual, I wanted to make teachers experts on using *Lexia* to improve their students' reading abilities.

Data Analysis/Interpretation of Findings

Restorative Interconnectedness

School and districtwide initiatives are often delivered piecemeal. MSAD #17 mandated, districtwide, posting learning targets and success criteria before every class. The district employs restorative practices and all teachers have access to training to improve the use of restorative circles in their classrooms. Our middle and high schools both invested in one-to-one Macbook Air laptops for all students and teachers have received extensive training in the SAMR model of utilizing technology to improve educational outcomes. However, such initiatives began and were developed in isolation of each other. A teacher can learn about all this and more and incorporate them into teaching practices without any overlap between one initiative and another. In order to gain all the benefits these great ideas can potentially do for a classroom, they need to be used in a way that each complements and enhances the others.

Therefore, the professional development that was offered to the teachers enlisted in the investigation went beyond the educational materials offered by *Lexia*. Instead of teaching the "best" way to use the software, the investigation sought the best way to integrate *Lexia* with all the practices that were common practice in MSAD #17. Sub-questions to the main research questions were developed in the course of the investigation; what practices did teachers currently value, and how can they be used to enhance and complement reading instruction?

Restorative practices in many classrooms at OHCHS are limited to the community-building or "ice-breaking" circle. At the start of each class, the teacher might ask students a seemingly mundane question. "What are your weekend plans?" or "What is your favorite pizza topping?" are the type of discussion starters designed to ground students at the beginning of

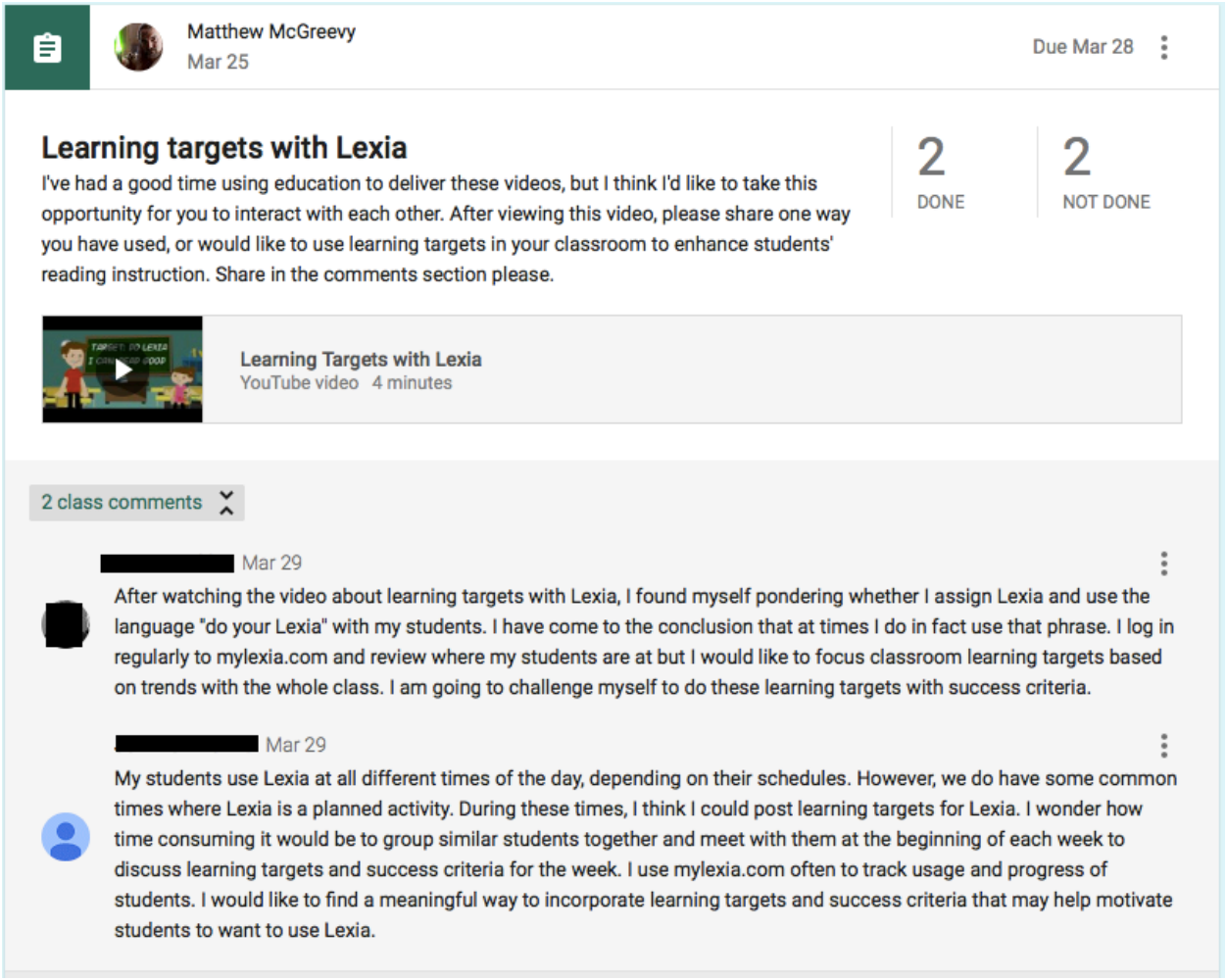
class, build rapport, and establish circle norms such as respectful listening. The foundation provided by these discussion norms can be useful for more serious discussions. The circle format can be used to address wrongdoing, repair relationships, or to discuss academics.

Remedial reading instruction is an emotionally charged issue for many students. Students with reading deficits perceive and endure public shaming when well-meaning teachers request that they read aloud. These deterrents can build up over time until the student avoids reading due to negative associations. Without any inherent drive to read for pleasure, such students can fall further and further behind their peers.

Although more traditionally applied to feelings of shame surrounding wrongdoing, restorative practices can be an effective pathway to working through shame in many forms. Teachers involved in this investigation were challenged to use community building circles to address reading and Lexia instruction. Rather than ask students about their favorite movie or their favorite ice cream flavor, teachers were told to ask their students what they found challenging about reading. Students responded that they hated reading, that they got embarrassed about reading aloud, and that reading made them feel stupid because everyone else seemed to be good at it. Although being able to speak openly about their difficulties with reading helps students to process these feelings, the continuation of this investigation would explore how to utilize restorative classroom practices to address feelings of shame and encourage students to think about remedial instruction as a way to take responsibility for improving their own reading abilities.

Learning Target Interconnectedness

During the 2014-15 school year, MSAD #17 asked all teachers to develop and post learning targets and success criteria before each lesson. This initiative was meant to improve student learning by employing metacognition. Students could think about what they needed to learn before engaging in the lesson. However, when it came to *Lexia*, there was another disconnect between initiatives. In the pre-assessment, all but one of the cohort shared that they "rarely" or "never" used learning targets and success criteria in conjunction with their *Lexia* goals.



The theme that emerged, over the course of online and in-person discussions (see illustration) as a result of the investigation, was that teachers needed to get beyond asking students to "do *Lexia*." Learning targets emerged as a potential vehicle to achieve this. Rather than using learning targets to ask students to work on the software, or "do *Lexia*" for a given amount of time, teachers needed to use the teacher portal to the software to find specific instructional goals for students to work toward and achieve. Rather than quantify student work on *Lexia* in time or units, teachers wanted to identify specific skills. This approach is more true to the goal of engaging student metacognition and also attaches teachers more closely to student learning by forcing them to engage in the monitoring software.

Teacher Starting Points

Another of the themes uncovered by the data was only tangentially related to the investigation. Like our students, teachers enter learning opportunities in different levels of mastery. While some entered this investigation already adept at most of the opportunities the software provides, some still required help with what might be considered basic skills; installing software on their own laptops, guiding students to install software on their laptops, and logging into a monitoring website with a username and password were all skills that some teachers in the cohort lacked at the beginning of the investigation. Therefore it came as no surprise that some teachers struggled to access the content of the investigation.

The home base of the investigation was a virtual classroom created within google platforms and it provided my first hint regarding the range of technical adroitness in my participants. A week after the first task had been posted, a single participant had not completed it. She was contacted to determine why she had not yet accessed the classroom. She shared that she

had not yet received the classroom code. One method for students to add a specific class in google classroom is to enter a code, available to the teacher, after logging in. Another is for the teacher to invite students directly. This participant had only ever used classroom codes to send or gain access to a virtual classroom in google and the assumption that all participants would have the necessary tools to sign in to the base of the investigation ultimately cost the research a week's worth of instruction for one participant.

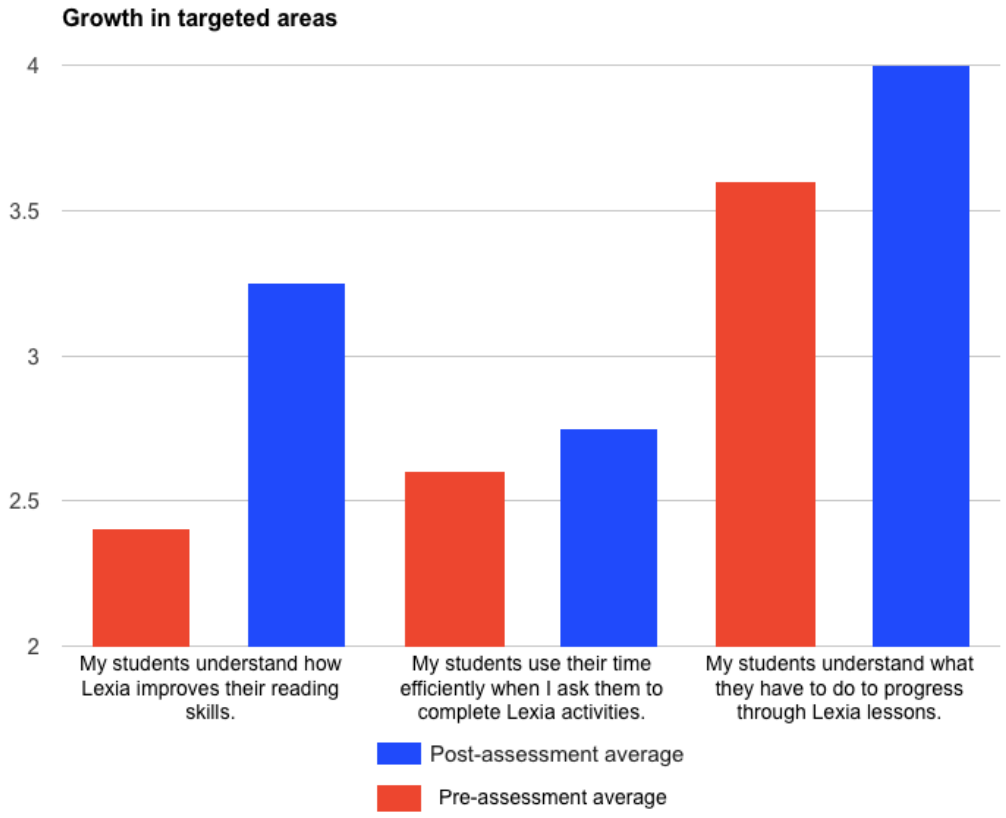
Because the content of the lessons was more accessible and entertaining as videos, but also required a higher level of engagement than a simple video, the videos were made interactive with the free teaching tools on educanon.com. Although several teachers commented on the usefulness of this delivery tool, saying that they wanted to utilize it in their own classrooms, others needed face-to-face support just to log in and access the video lessons. Once again, the potential gains of utilizing redefinition-level technology to deliver the content of the lesson was offset by participants' inability to access that technology.

As it relates to the investigation, the challenge of participants lacking technical expertise directly impacted the goal of using backward design principles to shape instruction. Teachers could theoretically understand higher order teaching skills involving computer aided instruction without understanding the basics of the technology interface. In practice, participants whose contributions to the investigation implied a higher level of comfort with technology were also more able to recognize interconnectedness, apply novel teaching concepts to established practice, and bring their own thoughts on instruction to the table. Although big-picture understanding is paramount, without the basic proficiency necessary to access computer instruction and teacher monitoring software, such initiatives are likely doomed to failure.

Conclusions/Implications

Teachers indeed benefit from deliberately designed instruction. Every participant involved in the investigation was able to articulate a skill or perspective that they intend to apply to their teaching practice. Those gains translated to gains in student understanding of the instruction and will eventually turn into the substantial achievement gains that were expected when time and resources were devoted to computer aided reading instruction.

The scope of the investigation was such that individual student achievement gains could not be quantified. Gains or losses on standardized testing over the five-week interval of the investigation would more likely be attributable to testing conditions, student focus, or luck. The number of students indirectly involved in the investigation through their teachers' participation is



also too small to be statistically significant. However, data collected from teachers (see illustration) indicates that they perceive their students to better understand how to use *Lexia*, how *Lexia* improves their skills, and how to use their time more efficiently when working with the software. Future research with this cohort should include a quantifiable comparison of student achievement, utilizing fall-to-fall student achievement data.

Depending upon your perspective, this investigation could be classified as a research project with professional development goals, or as professional development with embedded research. Assuming the latter paradigm, the implication for professional development is profound, yet simple: We need to teach teachers like we teach our students. Putting content in front of them is not enough. Professional development should be conducted using backward design principles, and with a thorough understanding of teachers' current abilities, goals and classroom practices.

This implication goes beyond the scope of teaching teachers to use new software. Professional development of special educators comes to mind as an area that could benefit greatly from backward design. "Compliance" is a frequently used term in special education, and rightly so. In the end, compliance forces districts to provide an appropriate education to students with disabilities. However, when compliance is the end, students might miss out on receiving an excellent education. Teachers and administrators focus on meeting the letter of the law rather than the purpose behind the law. Understanding the purpose of special education laws turns compliance into merely a symptom of excellence.

Interconnectedness turned from an afterthought into a strength over the course of the investigation. Being able to infuse teaching practice and behavior interventions with an overall

knowledge of the school norms produced positive impacts all over the classroom, not just when students opened their laptops to work on *Lexia*. Restorative and team building circles were revitalized in classrooms where they had become routine and stale. Actively aligning *Lexia* instruction with learning targets got students thinking about how the software helped them to build their reading skills, but also forced teachers to dig deeper into student data. This helped identify individual student struggles as well as trends in the classroom.

This finding should impact the way we think about providing professional development to teachers. Traditional models bring in outside experts to inform teachers of new developments and skills, or bring teachers from many schools together to learn about the issue and bring skills back to their sending districts. In this way, a school district can feel confident that they are providing their staff with someone knowledgeable; however, outside experts are not as fluent in the way individual schools work. Presenters in these paradigms necessarily lack information, both tangible and intangible, about the schools for which their development will impact. What unsuccessful attempts have the teachers already tried? What are some strength of the staff and students? And most importantly, what other programs are currently being implemented that could dovetail to complement the new programming? The needs of a school could be better served by someone with a more intimate knowledge of how it works.

Rather than employ outside experts, specialists, and literature to initiate changes in schools, the results of this investigation suggest that more might be accomplished through the utilization of teacher-leaders to drive staff development. In addition to all the advantages stated above, familiarity with other schoolwide initiatives, staff and student strengths, and school climate, teacher leaders have the additional benefits gained from having a personal relationship

with teachers in the school and can engage their peers much more effectively than a piece of literature or a specialist brought in for a one-day workshop. As the familiarity of a capable and trusted teacher improves achievement in children, similar results should be expected in adult learners.

Committing to bringing our practices in line with our stated purposes will take understanding. Teachers resist unfamiliar changes, especially those that don't produce immediate results. Neither *Lexia* nor other initiatives referenced in this investigation are likely to positively change a classroom overnight. Some teachers are likely to abandon them at the first sign of resistance and revert to their comfort zones. Understanding the purpose behind the initiative, not just the "script," but the hows and whys, will enable teachers to understand day-to-day struggles in the context of the big picture and ultimately result in successful school change.

Personal Learning Reflection

Completing this investigation was a productive process for me and for the teachers I collaborated with. As an aspiring leader, I have experienced firsthand the frustration related to failed educational initiatives. Well meaning reforms and changes can become so diluted by the time they trickle down to front-line teachers, and teachers can be so overwhelmed with the number of new practices to incorporate with what they already do, that they do not wholeheartedly embrace newness. This investigation improved my understanding of this reluctance. Just as an understanding of our students' processing can improve our teaching practices, understanding the context of teaching practices helps us develop better teachers.

The process of the investigation was engaging, exciting, and satisfying in the end. I was enthusiastic to help teachers develop a better understanding of *Lexia*. I also knew from teaching

experience that I did not want to distribute scholarly articles in order for my participants to improve their understanding. I have had great success in the past few years with my students by utilizing fun, interactive, digital tools and I wanted to harness some of that for my investigation. Making cartoon-style videos for adults provided a break from the norm for both me and my participants. I think they were afraid that they would have to devote lots of time and deep thinking to the investigation, when the idea (reinforced by the cartoon format) was really to put things in the simplest form. In the end, I received more inquiries about the digital tools that I utilized to present the content than I did about the content itself. However, feedback regarding the investigation was also quite positive. It was satisfying to help teachers become better at their craft. I finished the investigation optimistic that a core of teachers exist to push this initiative forward.

Several years ago, I was lucky enough to share students with a hard working high school science teacher with whom I became friends. Frustrated with her co-workers' unwillingness to embrace a schoolwide initiative, I believe it was restorative practices, she called them out on social media in an epic rant. "Why was it," she began, "that teachers seem to be the only employees in the world who can do the opposite of what their bosses tell them?" She went on to express her frustration that the district had spent extensive time and resources in order to train and support all of the teachers in this initiative, mandated that teachers use elements in their daily practice, and then teachers simply refused to do so. I remember "liking" the comment immediately and gaining satisfaction from the fact that I was one of the few teachers doing what I was asked to do. However, publicly shaming teachers into working harder is about as effective as shaming students into working harder. Anyone who's worked in education knows someone

with a “blame students first” mentality. When students fail to achieve, these teachers expect students to change rather than adjusting their own teaching practices, doubling down on failure. As satisfying as it can feel for those in charge to blame teachers for not following through on important, time-consuming initiatives, it will not get the job done. Thoughtful and deliberate professional development, incorporating teacher need and school wide context, can change the way we provide professional development and break the cycle of failed reforms and initiatives.

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Appendix A:

Links to instructional material presented to participants in investigation:

This interactive video links *Lexia* instruction with restorative classroom practices: https://www.playposit.com/listcode/383318/o5305a?cn=s

This interactive video puts *Lexia* in the context of the SAMR model: https://www.playposit.com/listcode/356244/o5305a?cn=s

This video discusses using learning targets and success criteria to enhance *Lexia*: https://www.youtube.com/watch?v=--JbG74D7oQ

This video is a how-to for teachers to learn *Lexia* basics - how to install and access *Lexia* software: https://www.youtube.com/watch?v=iuU89YD_Sx8

Appendix B:

Consent Form
For Participation in Research on Teaching Methods

Dear Special Education Teacher,
You are invited to participate in an action research study on your utilization of *Lexia* software being conducted by Matthew McGreevy as part of a graduate program at the University of Maine at Farmington. As a result of this study, we hope to improve your understanding of how computer assisted instruction can augment your reading instruction, complement your classroom dynamics, and ultimately improve outcomes for your students. With your permission, we would like to collect data about your current use of *Lexia* software and document your progress in its application when given instruction in its implementation.

What will you be asked to do?
If you choose to participate, your participation in this study will require five to ten hours of your time over the course of two months. In addition to brief pre and post assessments, you will be expected to complete a series of formative, task-based assignments designed to improve your proficiency and understanding of *Lexia* software and how it fits with your classroom practices.

Risks
The time commitment to participate in this research is significant and may constitute a risk in participating in this study. You may not be comfortable answering some questions about your classroom practices; you are free to skip questions you do not wish to answer.

Benefits
At the conclusion of this study, you will be awarded 10 recertification contact hours through OHU. You and the students you serve may also benefit from your improved understanding of *Lexia* software and effective reading instruction. Aside from these benefits to the participant, this research will help me learn more about applying backward design theories to helping teachers better use computer assisted instruction in their classrooms.

Confidentiality
The documents and files from this study will be stored on Google platforms and will be secured with a password. Some data may also be shared with Christopher Strople, faculty member for the course. All data from the study will be kept for five years and then destroyed.

Voluntary
Participation is voluntary. If you choose to take part in this study, you may stop at any time. You may skip any questions you do not wish to answer. There are no repercussions for not participating in this research.

I _____ have carefully read this form and fully understand the purpose of this research and the procedures to be followed. I understand that my identity will remain confidential. I understand that my participation is voluntary, and that I may withdraw at any time without penalty. I also recognize that I may skip any questions that I do not wish to respond to. Results of this research will be shared in the form of one or more publications and verbal presentations. If I have concerns or inquiries about my rights as a research subject or if I have questions about the manner in which this research is conducted, I understand that I can contact Dr. Christopher Strople (christopher.strople@maine.edu, (207)778-7015), advisor on this study. By signing below, I assert that I fully understand the above and give my consent to serve as a subject in this research. (If you would like a summary of the results, please request of the researcher at the contact information given above).

_____ _____
(Date) (Signature)

Appendix C:

Administrator Consent Letter

Dear Mr. Colpitts

My name is Matthew McGreevy and I am a graduate student at the University of Maine Farmington. I am interested in conducting a research study in the Spring of 2016. I will be collecting data from January through April and presenting my research to my peers in an open symposium. I am interested in exploring the application of backward design theory to help middle and high school special education teachers better utilize *Lexia* software to augment reading instruction.

I would like to work with a small cohort of special education teachers whose participation would be voluntary. I would invite them to participate via google classroom. Teachers would complete a pre-assessment in which they would self-assess their abilities to perform a variety of skills necessary to the effective implementation of *Lexia* and other computer aided instruction. Using this data, I will design instruction for the teachers that will go beyond providing a cursory knowledge or "how-to," and rather try to provide contextual understanding of the technology and it's potential for improving the classroom.

I will not share identifiable data about students, parents, or teachers involved in the study. If you have questions about the research, you may contact the principal investigator, Matthew McGreevy, at matthew.mcgreevy@maine.edu or (207)336-3602 or Dr. Christopher Strople, at christopher.strople@maine.edu or (207)778-7015.

Thank you for considering this request to conduct research,

Matthew McGreevy
Masters Candidate in Educational Leadership

I have reviewed Matthew McGreevy's research plan for "Making *Lexia* Work: A Backward Design Approach to Helping Teachers Utilize Technology." I give my consent to conduct this research in the Spring of 2016. I may ask to view the completed study at the end of the study.

_____	_____	_____
(Date)	(Name)	(Position)

Appendix D:
Pre-post assessment survey

Making Lexia Work

* Required

1. **Understanding 1** *
   I understand how Lexia improves my students' reading skills
   Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

2. **Understanding 2** *
   My students understand how Lexia improves their reading skills
   Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

3. **Understanding 3** *
   How does Lexia software help your students' reading skills?

   _____

   _____

   _____

   _____

   _____

4. **Teacher experience 1** *
   I can measure student growth using detailed data from districtwide assessments and my own assessments.
   Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

5. **Teacher experience 2** *
I know immediately when one of my students struggles on a Lexia skill.
Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

6. **Teacher Experience 3** *
List any assessments you currently use, or assessments your students take with other teachers, that measure some aspect of reading ability.

_____

_____

_____

_____

_____

7. **Classroom management 1** *
I use Lexia learning targets and success criteria in classes when I intend to use the software.
Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

8. **Classroom management 2** *
My students use their time efficiently when I ask them to complete Lexia activities.
Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

9. **Classroom management 3** *
What practices do you currently use to increase on-task engagement and improve the classroom atmosphere?

_____

_____

_____

_____

_____

10. **Student experience 1** *
I can install Lexia on my students' computers and troubleshoot software issues to get them started.
Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

11. **Student experience 2** *
My students understand what they have to do to progress through Lexia lessons.
Mark only one oval.

	1	2	3	4	5	6	
disagree	◯	◯	◯	◯	◯	◯	agree

12. **Student experience 3** *
What practices do you currently use to increase on-task engagement and improve