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Perceived Influence of Adoption of Personal Electronic Response Systems by Students With and Without Disabilities and Limited English Proficiency in Small Social Work Classes

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This study investigates the perceived influence of adoption of personal electronic response systems (clickers) on undergraduate and graduate social work education by students with and without disabilities and limited English proficiency (LEP). A mixed methods exploratory quasi-experimental (posttest only) design was used in this study of instructional technology in social work education. Self-report questionnaires were completed by 30 undergraduate and graduate students, and follow-up telephonic interviews were conducted with a subsample of 6 students with disabilities or LEP. Correlates examined were student status, level of life stress, and usage status. Qualitative themes emerged suggesting that students with LEP and with varied sensory, cognitive, and physical disabilities found clickers to be helpful in increasing their class participation and as assistive technology to support their learning. Student status and achievement associations with clicker use perception were explored to determine whether these important student characteristics suggested a profile of clicker user attitudes. Quantitative findings suggested that overall perceptions of clicker use were positively correlated with student status ($r = .53$; $p = .03$), with graduate students holding more favorable opinions than undergraduates, and that first-time clicker use was inversely correlated with Grade Point Average (GPA) ($r = -.53$; $p = .03$ for current GPA and $r = -.57$; $p = .04$ for cumulative GPA), suggesting that first-time clicker users had higher GPAs than nonfirst-time

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users likely accounted for by the higher required GPAs of graduate students, who were more likely to be first-time users. No significant correlation was found between these stressors and perceptions toward adoption of classroom electronic response technology.

KEYWORDS classroom technology, disabilities, limited English proficiency, social work education

Current literature on the use of instructional technology in higher education reports on positive impact on educational process and outcomes, including class participation, instructional equity, and class grades, but there is a gap in the literature on perceptions of impact by students experiencing college life stressors and those with limited English proficiency (LEP) or disabilities which affect learning (Smith, Shon, & Santiago, 2011). Because the broader literature on diffusion and adoption of technology innovation suggests that highly stressed or minority/marginalized individuals and groups are less likely to be early adopters (Golub & Jackson, 2012; Li, Wu, Luo, & Zhang, 2013; Rogers, 2003), this gap in the social work education literature may be fruitful for investigation in the context of diversity as well as in the interest of promoting adoption of instructional innovations.

One form of instructional technology which has proliferated in higher education, as well as secondary and presecondary education, is the personal electronic response system, or audience response system, typically termed "clickers" (Penuel, Boscardin, Masyn, & Crawford, 2007). Clickers are hand-held remote control keypads (see an example in Figure 1), or software applications downloaded to smartphones or laptops, which transmit signals to a receiver linked to the instructor's computer or online platform in response to instructor queries in either face to face or online instruction (e.g., e-Instruction™; TurningPoint Technologies™; iClicker™). Students use the system to send anonymous responses to multiple choice questions displayed in PowerPoint slides or posed verbally by the instructor, or to "vote" in activities such as attendance taking or opinion polling. Responses are instantly tallied and can be graphically displayed on the computer or online platform site.

Universities adopted these systems initially to assist in monitoring attendance and supporting information retention in large classes (Griff & Matter, 2007; Morling, McAuliffe, Cohen, & DiLoenzo, 2008), with a trend subsequently to extend their use for testing and engaging active and socially equitable student participation (Penuel et al., 2007; Poirier & Feldman, 2007; Stowell & Nelson, 2007; Trees & Jackson, 2007). Clickers have been used in medical and nursing education since the 1990s (Premkumar & Coupal, 2008; Skiba, 2006). Initially, in the liberal arts, clickers were used mainly in science and mathematics departments since around 2000 (Beuckman,

FIGURE 1 Clicker (response unit/pad) type used by study sample: the Classroom Performance System distributed by the eInstruction Corporation. (Figure available in color online.)

Rebello, & Zollman, 2006; Brewer, 2004) and are beginning to be used in the humanities and social sciences since around 2006 (Brewer, 2004; Parmenter, 2006).

To date, the literature on personal response systems suggests they may enhance active learning when used by experienced instructors who change their instructional styles when using them (Hughes, 2005; Masikunis, Panayiotidis, & Burke, 2009), as well as improve information retention, class participation and attendance, early identification of students at risk of failing, and class grades (Cole & Kosc, 2010; Karaman, 2011). Reportedly, instructors also find them useful in managing large classes (Trees & Jackson, 2007). Literature on adoption of innovations suggests that not only academic characteristics such as class standing, but also life stress and peer social network effects may influence attitudes toward and willingness to adopt innovative practices (Golub & Jackson, 2012; Rogers, 2003; Trees & Jackson, 2007). However, the influence of stress levels and social group type on college students' perceptions and acceptance of personal response systems has not yet been assessed. This information may be helpful to social work educators in considering effective methods to engage students in early adoption of innovative or novel classroom technologies, and respond to student anxieties about or resistance to them which may be expressed directly or through lag in utilization. Perceptions of students from diverse social groups are of special

concern in considering whether they may be educationally disadvantaged or, conversely, supported by personal response systems.

Prior literature includes description of applications in different disciplines and outcomes of participation, attendance, information retention, grades, testing (Fies & Marshall, 2006). There is a small but growing literature on the use of this technology in social work specifically and human services education in general (Quinn, 2007, 2010). Social work educators have not been in the vanguard of adopting classroom technology such as personal electronic response systems, perhaps due to smaller sizes of social work classes compared to the liberal arts and sciences and to the historical emphasis on transfer of professional skills as an art, not a science (Graybeal, 2007; Wakefield, 2000).

Clickers were adopted campus-wide by the investigator's university in 2006 after extensive trial and study as part of the active learning initiative embedded within an accreditation Quality Enhancement Plan (Parmenter, 2006). This southwestern university has one of the highest levels of student diversity in the nation, and also has a well-equipped disability support service with a sophisticated array of assistive technology available to students with documented disabilities. Its social work department offers professional education at all levels from doctoral to undergraduate, and sponsors an active continuing education department for licensed professionals. This investigator was the first to utilize clickers in the social work department and used them only in group mode for formative assessments and reviews, and in both teacher-led and student-led mode for summative assessments. This social work department at that time had an average class size of 25. This study was initiated to explore the following research aims:

- to investigate perceptions of clicker use by the general population of social work graduate and undergraduate students, and by those with LEP and disabilities;
- to investigate whether these perceptions are associated with academics characteristics, such as grade point average (GPA) and graduate or undergraduate student status;
- to investigate whether these perceptions are associated with being a first-time or repeat user of clickers; and
- to investigate associations between life stressors and perceptions toward adoption of classroom electronic response technology

METHOD

Design

The study protocol was approved by the university Institutional Review Board. This exploratory study utilized mixed methods in a quasi-experimental

posttest only design. The quantitative questionnaire component and the telephone interview qualitative component were done after the end of a semester in which social work students utilized hand-held clickers in face-to-face classes. The qualitative component utilized a phenomenological approach to explore the lived experience of clicker use for students with disabilities, LEP, or both. One contrast case of a fully bilingual student was selected for interview also.

Sample

The sample consisted of 35 female undergraduate and graduate social work students who consented to participate. Their average age was 30.75 ($SD = 10.55$) and 85% were Caucasian. They had an average cumulative GPA of 3.60 ($SD = 0.41$) at the time of the study, and 76% were graduate students. Six students disclosed documented disabilities and/or LEP or both, and so met the criteria for follow-up interviews regarding their experience with and perception of clickers in terms of those specific characteristics. A seventh student who was fully bilingual and did not disclose disabilities was interviewed as a contrast case.

Procedures and Data Analysis

Students were recruited from graduate and undergraduate classes taught during one semester. Self-administered instruments were completed in class at the end of the semester in which students utilized clickers for active learning exercises (including opinion/attitude polling, ungraded knowledge pretests, case application prompts prior to discussion, course content review, and testing). Two mailed/e-mailed follow-up reminders were sent to absentees and nonrespondents. The instrument included an open-ended comment section. Descriptive, bivariate, and multiple regression analyses were performed on quantitative data.

Telephonic interviews using open-ended probes were conducted with students with disabilities and LEP. Transcriptions of interviews and written responses to open-ended questionnaire items were thematically coded to identify perceptions of students with and without disabilities and LEP.

Measures

The study self-report instrument (available from the author upon request) consisted of demographic items, 11 Yes/No clicker-related items constructed for this study, and the entire Young Adult Family Inventory of Life Events and Changes (YA-FILES; 77 Yes/No items), which was designed and validated on a male and female college student population and includes a 31-item subscale specific to adjustment to college and college-related stressors (McCubbin, Patterson, & Grochowski, 1996).

YA-Files are designed to measure young adult stressors and strains. Each "Yes" response received one point, and the total score is the sum of those. The normative sample had an overall mean of 196.93 ($SD = 18.42$), and the instrument exhibited good internal consistency ($a = .85$), good stability (test–retest correlation = .85), good prediction of college GPA, and fair concurrent validity with adolescent substance use and adolescent locus of control. The Inventory was selected to gather data on students' levels of life stress, as a potential influence on adoption of innovative classroom technology. Examples of items include: felt financial pressures regarding how to pay for tuition, books, and so forth; felt your being in college has placed added strain on your family.

The study-generated instrument items gathered data on students' disability and language status as well as standard demographic information and prior history with and perceptions of clickers. Each "Yes" response received one point, and the total score is the sum of those. Examples of clicker-related items include: This was the first time I had used this technology; I had no trouble registering my clicker; I got used to using a clicker readily; the clicker enabled me to participate in discussions more; clicker use makes class discussions and reviews more efficient.

RESULTS

A majority of respondents were using clickers for the first time. The average Inventory score indicated low stress levels ($M_{yascore} = 17.42$ [$SD = 6.80$]), as did the college subscale ($M_{collegesubscore} = 9.32$ [$SD = 4.80$]). Out of a possible score of 11 on the clicker perception items, the range of scores was 5–11 and the mean was 9.18 ($SD = 1.33$). All items were answered positively by 73% or more of the sample, with the exception of the ease of registration item, which was a 50/50 split. All of the respondents agreed that the clicker was helpful for class participation.

Positive correlation was found between perceptions and student status ($r = .53$; $p = .03$), indicating that graduate students held more favorable opinions about clicker use than undergraduates. Negative correlation was found between first-time clicker use and GPA ($r_{currgpa} = -.53$; $p = .03$ and $r_{cumgpa} = -.57$: $p = -.04$). The inverse correlation suggests that first-time clicker users had higher GPAs than nonfirst-time users, likely accounted for by the higher required GPAs of graduate students, who were more likely to be first-time users. No significant correlation was found between these stressors and perceptions toward adoption of classroom electronic response technology.

A multiple regression analysis tested the associations among the predictors of student status (graduate or undergraduate), user status (first-time or repeat user), and YA-FILES score with clicker perception score; the model was not significant. Another multiple regression analysis tested the associations among the predictors of clicker perception score, age, and YA-FILES score on

the dependent variable of GPA. Only one significant relationship was found in the analysis ($F = 3.39$; $p = .05$; $R^2 = 22.7\%$): age significantly predicted cumulative GPA ($B = .02$; $p = .02$). Clicker perceptions were not a significant predictor ($B = .02$; $p = .72$).

Qualitative comments written in on the instrument indicated themes of difficulty with initial adoption, followed by perceived utility for information retention and expanded class participation. Example comments were:

- "Rocky at first, but it Rocked!"
- "Clickers took awhile to adjust to when test taking because of new technology, but otherwise GREAT!"
- "Using the clicker was efficient but sometimes took longer with exams. There seems to be a language barrier with use of the clicker."
- "It did seem beneficial when preparing for exams. I don't think I would have done as well on exams if we didn't review questions with the clicker beforehand."
- "The clickers are effective in regards to more class participation and it involves all students not just one."

Qualitative results from the interviews suggest a range of reactions from students with LEP and favorable perceptions from students with disabilities (one of whom also had LEP), including one who had elected not to use the available accommodations arranged by the university Office for Students with Disabilities. For example, two international students with LEP had contrasting views. One stated,

> My opinion about the clickers that I used during class is that I did not like to use it, because it created confusion when I answered the questions. I preferred to answer test question by using pencil and paper (old fashion [sic] style).

The other, who was repeating the class, stated:

> Clickers for me is [sic] more helpful for non-English speaking people. Yes it comes from my experience; I think, I learned more from clicker than the first time I took this class. It made it easier to remember the DSM terms and medication names. I think for myself I see it more comfortable with exam. First time I took this class [without clickers] had not equally helpful learning activities so I got behind English speakers.

A student with vision impairment and LEP shared:

> This was first time I used clickers in college. But in research class had to use computer to click abc on test, and students complained about not enough time to do, especially because research material not easy to understand and had to think about it a long time, because needed more

> review so felt more time pressure. They did not practice reviewing for the test using the computer and [it was] timed. But in clicker class, we reviewed for the tests using the clickers, just like the test. It was fun to use the clickers, because that way, the student's brain has to work active, can't fall asleep in the afternoon like usual . . . after I was taught where ABC was on clicker, it did make me think about the question, to use the ear to listen, not hard, but easy because forces quick decision re clicking. People in many different countries/languages have low vision, but easy to follow because can see on the paper and click on clicker. Easy to use the clicker but not 1st time, after 2–3 times learned to use clicker.

Another student with hearing impairment with accommodations (fully bilingual) said:

> It [clicker] was awesome, very helpful in terms of my hearing loss because it was very visual. It was all right there, it would help students with disabilities, especially hearing loss. It was helpful for participation, too, to be able to see everyone's "vote" on a question visually. I have to read what the CART typist is typing to find out what the other student is saying in class discussion, so there is a time lag in a general discussion.

Similarly, a student with epilepsy and learning disabilities (with accommodations) felt:

> This was my first experience with the clickers, with electronic technology in the classroom. I did take an online class years ago, and just did a videoconference distance education class with the monitor this semester. I failed the first online class because I took it right when my epilepsy was first diagnosed, before my meds were straightened out, and the computer flickering would trigger seizures. I don't know that clickers are that similar to other tech-assisted learning. It is an entirely different type of learning. I love the ideas of the clickers. It worked very well for me in terms of interactive learning.

The student without accommodations had a hearing impairment (fully bilingual but limited in signing), and used a hearing aid with unsatisfactory results for classroom use. She commented:

> I wear a hearing aid in my left ear, however, the hearing aid has NOT been effective. Therefore, I have to position myself to where I can hear on the side where I have the most strength. At first, I thought it [clicker] was going to be different and hard, because I was used to paper and pencil. But then I thought it was interesting to see what other students thought and neat knowing immediately what the answer was and getting results for the test. It was not difficult to use the actual clicker, once we had the tutorial. There was no impact on hearing impairment in using clickers. Did not affect it. I could see the screen and if the person talking was clear, not a problem. It did make you more attentive, concentrate

> more to see if you understood the material and got the same answers as others. Just having the clicker number is very useful for a student who is reluctant to raise her hand and answer a question in class—that type of student—to allow them to participate more.

As a contrast case, a student who was fully bilingual and did not have disabilities shared these comments:

> I liked it [clicker]. Not so much of a disadvantage for bilingual students because no different from handing out a test, pretty much the same thing, just like an overhead. It was really useful for visual learners, but we would always discuss the questions afterward as well, so even if you are an auditory learner you would learn from it afterwards. I noticed actually that the whole class participated versus the handout test. If we go over the test not too many people participate because either they are looking ahead to see what they missed—or because it is on the overhead, and more people raised their hand to find out why they got it wrong. Advantages from my own perspective, it seemed more relaxed than handing out tests and just staring at the test. That was an advantage for me, instead of handing out the test, and staring at page after page, I could look at a ppt. Disadvantage was people having to go back and change their answers, frustrating if verbal interruption. I did not feel much time pressure using clickers for tests. I actually felt we were at a better pace, because while other people are taking more time, the rest can reread the questions and think more, since it is not timed. Other than testing, that helped me a lot because I am more of a visual learner and it helped me a lot because I really remembered which question I got wrong and how many other people got it wrong or right. So you would put more emphasis on that question or the discussion afterwards when teacher reviewed if several got it wrong.

DISCUSSION

Qualitative findings suggested that students with LEP and with varied sensory, cognitive, and physical disabilities found clickers to be helpful in increasing their class participation and as assistive technology, facilitating attentionality, decoding and acquisition of new scientific vocabulary, memory, and comprehension, and decreasing test anxiety. Most students without disabilities or LEP found clickers also decreased their test anxiety, and increased enjoyable engagement with course material through clicker-facilitated active learning activities. Others felt clicker use increased their test anxiety and frustration with class flow when the technology performed imperfectly, even when clickers were seen as enhancing class participation, interest, and attentionality class wide. This minority view has been found in other studies of electronic response systems as well (Prewitt & Oropeza, 2008).

Overall, clicker use was preferred by graduate students, who held more favorable opinions than undergraduates. Because no association was found

between overall stressors or college-related stressors and perceptions toward adoption of clickers, this sample of social work students did not appear to be influenced in their adoption of this classroom instructional innovation by their life circumstances, as has been found in other studies of innovation. Alternatively, the sample size and low stress level of the sample may simply have not offered enough variation to detect such influences. Of interest, this study's findings suggest that personal response systems may be viewed favorably and yield improved instructional outcomes in small classes and in graduate social work education as well as in large classes, and undergraduate education. Findings of positive perceived effects for students with disabilities and LEP suggest that clicker use may indeed promote instructional equity in social work classrooms, thus showing consistency with a key social work value: social justice.

Limitations of the study include its modest sample size and posttest only, one group design. Future research in this area could replicate the type of sample, measure, and mixed methods approach of this study with a larger sample and within a pretest/posttest and control or comparison group design to increase rigor and power. Use of clickers shows promise as a means of promoting not only the previously documented instructional gains for the general college student population, but also for instructional social equity for students with LEP and with disabilities. This class-wide instructional strategy, which goes beyond student-specific accommodations, deserves further study.

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