

# RUTGERS

UNIVERSITY | NEW BRUNSWICK



## **Report of the Clicker Task Force**

**May 6, 2017**

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## Charge

In November 2016, The Rutgers-New Brunswick Vice Chancellor of Undergraduate Academic Affairs, Ben Sifuentes-Jáuregui, formed a ‘clicker’ task force in response to concerns raised by the Rutgers University Student Assembly (RUSA) about the additional expense to students from having to purchase multiple clicker response systems for different courses. The term ‘clickers’ refers to both hardware systems using a dedicated physical clicker and those that charge a registration or subscription fee for use through laptop, tablet, or mobile devices (web/mobile). We will refer to all such systems as ‘clickers’ or classroom response systems.

The task force was charged with the following:

- *Assess clicker needs for the Rutgers-New Brunswick community for both students and faculty.*
- *Review current NB Campus clicker initiatives and university practices and priorities related to clickers.*
- *Examine technical capabilities of NB classrooms. Survey approaches of other big 10 schools.*
- *Identify pilot vendors for future implementation.*
- *Based on this, the committee comprised of faculty and students will make recommendations for broader consideration and implementation*

The Task Force’s committee members consisted of students, faculty, technical staff and administrators. The committee held three meetings and a number of information gathering sessions, during which it had discussions with student RUSA representatives, examined practices and policies of other Big10 schools, met with staff technical experts and discussed technical capabilities of Rutgers-New Brunswick classrooms and support issues, conducted and analyzed clicker use surveys of both students and instructors, obtained information on security, accessibility, configurations and pricing from major clicker vendors with a presence at Rutgers, had discussions with vendors and technical staff of other Big 10 schools, held system demonstrations, and had conversations with many current Rutgers clicker users, both students and instructors.

## Recommendations

The committee recommends the following:

1. **Rutgers New Brunswick adopt a policy of standardizing central support on a selected set of clickers currently in widespread use in Rutgers New Brunswick undergraduate courses -- specifically, iClicker and Turning Technologies.** Such standardization is employed by a number of Big 10 and other schools. This approach would provide guidance to instructors, on which systems are widely used by students and have central technical and instructional support (including LMS integration and security and accessibility certification). Identifying these systems as centrally supported can reduce the number of clicker brands students might need to purchase for different classes. While instructors can adopt other clicker brands, they will need to satisfy security and accessibility standards, and be aware that they may not have LMS integration. Note that the initial selection of iClicker and Turning Technologies does not necessarily indicate the committee’s assessment of their technical superiority over other systems, but rather the fact that they are widely used and currently supported and integrated with various Rutgers’ Learning Management Systems, as well as that they meet accessibility and security requirements. (53% of Instructors reported using iClicker, 28% Turning Technologies, others

considerably less). The determination as to which systems should be included should evolve with new usage patterns and new technology.

The committee had considered the option of recommending that undergraduate courses at Rutgers-New Brunswick standardize on, or require use of a single brand of clicker. This was viewed as impractical and undesirable. No other school that we have researched has explicitly done this. While the different brands have similarities, they have significant differences and thus there are varying, and strong, differing system preferences on the part of students, instructors and schools. For example, the multi-campus Rutgers Business School (RBS) has implicitly 'standardized' on Turning Technologies systems, while a number of SAS units favor iClicker, and some units see many different systems in use in their classes. In the committee's surveys, 87% of students and 46% of instructors indicated they would be very upset if they had to switch brands. (The student upset may include cost issues of replacing the system they are currently using). As with textbook choices, instructors have expressed strong views about which system works best for them and some indicated that imposing a system on them might be an infringement of academic freedom. Others stated that they would stop using clickers if forced to switch. In addition, there would be significant conversion costs for instructors if required to switch systems, both in terms of learning the new system and conversion of existing instructional materials. Some instructors have 'bundled' their clickers with textbooks, often with very favorable pricing for students and again imposing a different system might raise the cost of clickers for their students.

Purchasing a University or campus wide enterprise license allowing 'free' student use of a selected brand was also considered. Ohio State University has such an arrangement with Top Hat. This shifts costs to the university, or perhaps bundles them in student fees. Such licensing reduces the need to purchase multiple clickers (although it still can occur), but also reduces instructor choice, and brings up many of the same issues as standardizing on, or requiring, a single brand. While other (paid) brands can be used, this would likely meet with strong student resistance when a free system was available. Depending on the number of users, such licenses are likely in the \$100,000+ range annually.

2. **A Rutgers' unit, likely OIRT or its successor, should be assigned as the focal point for providing online information, support and outreach for clickers at Rutgers-New Brunswick.** Numerous studies suggest that clickers can serve an important instructional role. Yet based on the committee's instructors' survey, only one-third of instructors are using them. And not all who use them are using them effectively, based on student comments. There currently is no obvious source of information about clickers for Rutgers New Brunswick. This unit should launch an initiative to encourage increased instructional exploration and adoption of clickers, develop a clicker web presence with both instructional and technical information, and provide training and instruction, as well as exploration of new technologies.
3. **The above unit should negotiate with vendors for improved clicker pricing for Rutgers' students.** This might include 'trade-in' credit for students switching between clicker brands and/or for a multiple system credit for students who have purchased (but do not wish to trade in) another system, as well as a possible reduced annual subscription for students who do not know whether to commit to a multi-year license for any selected/ recommended/ standardized / supported clicker brand. RBS OTIS (computer support) unit does some of this on behalf of their students with Turning Technologies. Based on preliminary conversations with vendors, there is some reason to believe some or all of these cost-saving options might be negotiable.

4. **More information on web/mobile and hybrid (BYOD-bring your own device) clicker systems should be disseminated to instructors.** These systems are relatively new and their performance has improved dramatically, as have classroom Wi-Fi capabilities on campus. Students generally favor web/mobile systems due to cost savings and the need to bring (and forget) less equipment to class<sup>1</sup>. BYOD can have an advantage to instructors in terms of providing additional student response capabilities (text and graphics, awkward or impossible on hardware clickers) and additional features. Some instructors do not wish to allow/encourage the use of phones and laptops in class due their potential for major distractions<sup>2</sup>. Some vendors are exploring browser lockout systems or use logging systems both designed to avoid or minimize such student behaviors.
  
5. **Any clicker system in use at Rutgers-New Brunswick should meet Rutgers' security and accessibility standards.** OIRT or another technology office should be charged with providing this review and this requirement should be widely disseminated. This unit should also deal with requests for LMS/clicker system integration for systems not currently receiving standardized central support.

## Clickers

Clickers, also referred to as Classroom/Student/Audience/ Personal Response Systems, are an instructional tool used to engage and interact with students in the classroom. Studies suggest they can improve classroom pedagogy, motivate students and keep them awake, provide immediate student feedback to the instructor, incentivize attendance, and assess student knowledge in both large and small classes<sup>3</sup>. They can be an important component of active and peer instruction strategies. Clickers can be purchased as a hardware device, like a remote control (physical clicker), or as an application for a mobile/web device – a smart phone, laptop and/or tablet. Systems that allow any of these are referred to as BYOD - Bring Your Own Device. Some clicker companies offer integrated solutions that work with physical clickers and BYOD or both (iClicker and Turning Technologies for example).

Using either a receiver (either a USB dongle or small box plugged into a USB port or installed in a podium) along with software or increasingly, over Wi-Fi or cellular service, instructors are able to pose objective and subjective questions – originally just multiple choice, increasingly numerical, graphical and text questions as well. These questions can be projected on a classroom screen, sent to a student's web/mobile device, or just verbally asked on the fly. Students respond on their device – a physical clicker or laptop, tablet or smartphone, or both, depending on the system used in that class. The instructor can then immediately display a bar chart or other summary graphic showing student responses, and, if desired, grade the responses on the fly, while the individual student scores are automatically stored in a spreadsheet. Responses can also be anonymous if desired by the instructor. Such 'clicked' questions and responses can be used to stimulate discussion, provide feedback to the instructor, engage students, and/or be incorporated in student grades. These systems can also be used to give formal quizzes or exams, with or without paper involved.

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<sup>1</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4648207/>

<sup>2</sup> <http://dx.doi.org/10.1080/87567555.2015.1005040> available through the Rutgers online Library system

<sup>3</sup> <https://cft.vanderbilt.edu/docs/classroom-response-system-clickers-bibliography/#reviews>

There are a number of clicker system vendors. The most widely used at Rutgers-New Brunswick are: iClicker, Turning Technologies, Poll Everywhere and Top Hat. Other systems include Learning Catalyst, Socrative, Kahoot and others.

There are a variety of different pricing schemes, generally requiring students to either purchase a physical device or a web/mobile subscription, or a bundle with both. Poll Everywhere (web/mobile only) is free for small classes, or the instructor can purchase a license for a larger class, or students can purchase an annual license. iClicker, Turning Technologies and Top Hat also have enterprise pricing, in which the institution purchases a site license, based on the number of licensed users.

It is important to recognize that all ‘clicker’ systems are not the same in terms of features, ease of use, reliability, cost, flexibility, accessibility, security, and ease of use. This may not be obvious to student users, as their experience and the instructor’s differ considerably in terms of system setup and preparation, LMS integration, grading, etc. There is considerable ongoing innovation in clicker system features and capabilities, and it is not unlikely that today’s favored system may not be tomorrow’s. Indeed, it can be argued that we are up to ‘next generation clicker systems’ with considerable additional capabilities beyond simple multiple choice and one way interaction<sup>4</sup>.

## **Clickers at Rutgers-New Brunswick**

There appears to be no clear policy or guidance on clicker selection or use at Rutgers-New Brunswick, with the exception of RBS which has an implicit standardization policy (we can find no online statement of the policy) and provides student and instructor support through its Office of Instructional and Technology Service (OTIS). Outside of RBS, assistance for instructors and students is separately provided by OIRT, CTAAR, DCS, and in some cases, department support staff. The selection and use of clicker systems in classes has evolved based on individual instructor choices, rather than through coordinated departmental or school plans. RBS has standardized on, and supports Turning Technologies systems – both hardware clicker and their web/mobile system, but individual instructors have used other clicker brands in RBS courses.

The task force developed information on student and instructor uses of clickers through online surveys conducted in early March. The online student survey was disseminated through multiple channels including: RUSA’s email links, email to all economics majors and minors, and requests to SAS, RBS, SEBS and other units and departments to forward to their students. Responses were received from 970 students with 94% reporting that they have or were using clickers in class(es). 34% of student respondents were in SAS, 30% RBS, 33% SEBS, 1% ENG and 2% other, including the Bloustein School. This breakdown may partially reflect the dissemination of the survey as well as usage patterns. 44% of respondents indicated their major area as STEM, 30% Business, 13% Economics, 4% other social science and 3% Humanities.

Instructor survey links were sent to all SAS instructors (faculty and PTLs), to SEBS instructors, to members of the Sakai clicker users site for instructors, as well as to various other lists of clicker users. 566 instructor responses were received, with 31% of instructors responding that they have or are using response devices, about half from SAS, 9% from RBS, 17% from SEBS 6% from engineering and 16% other. This breakdown may also be impacted by the dissemination of the survey.

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<sup>4</sup><https://www.pearsonhighered.com/products-and-services/course-content-and-digital-resources/learning-applications/learning-catalytics.html>    <http://pubsdc3.acs.org/doi/full/10.1021/acs.jchemed.5b00799>

The systems used most widely, according to instructors' responses to the survey, are iClicker (53% of instructors using clickers), Turning Technologies (28%), Poll Everywhere (17%) and Top Hat (12%). iClicker and Turning Technologies primarily used physical clickers (mobile/web versions are only recently available), with about 3-4% using mobile only and about 20% using both. Poll Everywhere and Top Hat are solely mobile. The student survey showed that iClicker was used by 79% of students, Turning Technologies by 67%, Poll Everywhere 17%, and Top Hat by 12% (since many students have used multiple clickers, the percentages sum to more than 100%).

Student and instructor experiences with clickers are rather different, and this impacts their satisfaction with the systems. Instructors must deal with setup, grading, LMS integration, and more. For instructors, 91% were satisfied (at least somewhat) with iClicker, 75% with Turning Technologies, 90% with Poll Everywhere and 85% with Top Hat (note that the number of instructors associated with these percentages are quite different for each brand). For students, 84% were satisfied with iClicker, 82% with Turning Technologies, 92% with Poll Everywhere and 76% with Top Hat. Note that Poll Everywhere was provided at no cost to students, unlike the other systems. Poll Everywhere and Top Hat have always been web/mobile only, an approach generally favored by students. Some dissatisfaction by both students and instructors may have been related to classroom connectivity issues for web/mobile systems. This appears to have been remedied by an OIT Wi-Fi upgrade program for classrooms.

Other systems that have been by used at Rutgers (based on instructor and student responses) include Kahoot, Learning Catalytics, Survey Monkey, Socrative, Sakai's Tests and Quizzes (an online testing tool in Sakai), google forms (self-created polls), mQlicker, students signaling with fingers (sic), and Arkaiive.com.

While the systems most widely used at Rutgers –New Brunswick (iClicker, Turning Technologies, Top Hat, Poll Everywhere) have much in common, there are significant differences as well. Both iClicker and Turning Technologies (TT) now support physical and mobile clickers or a combination (iClicker calls their combined system REEF while TT's is ResponseWare). This is a relatively recent change to their earlier hardware-only clicker systems. iClicker works with a toolbar that 'floats' above whatever is on the screen (PowerPoint, Word, anything else), while TT can work with a floating toolbar or by integrating their question slides into PowerPoint. Both iClicker and TT sell physical clickers to students, but TT also has begun to require an additional annual or multi-year subscription for use of the physical clicker in addition to the purchase price, while iClicker does not. Both charge an annual or multi-year subscription (licensing) fee for their mobile/web apps. TT has a richer set of question types, but a somewhat more involved instructor setup process. Both iClicker and TT indicate they meet FERPA specifications and are ADA compliant. An examination by Charles Collick of OIT confirmed that both were "moderately accessible and therefore usable at the University". Both also support self-paced testing and integrate with Sakai, Canvas, Blackboard and other LMS.

Top Hat was an early entrant into the use of mobile/web (and sms text) access rather than physical clickers (note that iClicker and Turning Technologies have followed them into web/mobile). Students use a web interface or a mobile app, while instructors use the web interface. Top Hat can work with a floating toolbar but the standard use involves working within their system to add question slides to an externally created and imported presentation (PowerPoint, etc.) which is then run through their web interface. Top Hat has a number of interesting features including a delayed response/offline feature (it can store and then send student responses when lost classroom connectivity is restored and will then check that the responses were indeed made at the right (in-class) time), it can draw/annotate slides when presented, students can view slides after class (if instructor allows this), it has a number of additional question types, a discussion (chat) feature, numeric responses (with tolerances), latex viewing; it can assign and 'push' questions for out of class review, can assign questions to specific students, can push out questions prior to class and more. Top Hat has a separate Pages feature that allows creation of interactive texts. Top Hat was

also judged to be “moderately accessible and therefore usable at the University”. And they indicate FERPA compliance.

Like Top Hat, Poll Everywhere uses no physical clicker. Interaction by students is through a web browser or mobile app, while instructors present through laptops and a web browser. For classes of 40 or less, use of a basic version is free, with no reporting or correct answer display capability. Paid versions, either \$350 a semester paid by the instructor for the class, or \$14 per student, unlocks reporting and other features including LMS integration (although Sakai is apparently not currently supported) and more. There is also enterprise licensing based on number of users. They are also viewed as accessible by OIT.

For some system comparisons, see:

<http://econweb.rutgers.edu/sheflin/UMDclicker.pdf>

<http://socialcompare.com/en/comparison/student-response-systems>

<http://www.fctl.ucf.edu/teachingandlearningresources/technology/crs/>

## Costs

Instructor access and/or software and hardware is generally free. Student costs for clicker access range from \$20 for a one-year license for mobile/web access, to \$80 for a five-year license and an upper-end physical clicker. Vendors offer rebates and trade-in credits, and iClicker and TT offer bundled hardware and mobile/web packages, allowing students to be prepared for different classes and provide redundancy if they lose or forget their physical clicker, assuming the instructor allows BYOD.

iClicker has two hardware clickers at \$47 and \$56 with no licensing required (note, pricing is from Rutgers bookstore – likely available at some discount online). They offer 1 year and 5 year mobile/web subscriptions (REEF - no hardware required) at about \$24 and \$47 respectively, which can be purchased online with no bookstore markup. And they have bundled hardware and mobile/web clicker packages.

Turning Technologies has several hardware clickers, all of which require additional paid subscriptions as well. The bundled pricing for their least expensive hardware clicker is \$45 including a one-year license, \$68 with a five-year license. Mobile/Web licensing without the hardware clicker is \$28 for one year and \$49 for five years and this can be purchased online with no markup.

Top Hat subscriptions are \$36 for one year, \$72 for five, with further discounting possible.

Poll Everywhere is free for small classes (with limitations on functionality) or it can be purchased for various class sizes by the instructor (\$350 for up to 400 students), or students can purchase access for \$14 per year, \$70 for five years.

All offer enterprise licenses based on the size of the user base. One vendor indicated that \$145,000 per year might be in the ball-park, with various alternatives depending on the contract length.

While clearly an important concern of students, instructors and technical staff also have a strong interest in minimizing student clicker cost. From the student perspective, there are two considerations - the cost of the first clicker system they purchase, and for some, the additional cost of purchasing different additional system(s) when needed for other courses or in later semesters.

Initial system costs depend somewhat on whether the system requires a hardware clicker or is web/mobile capable (or both). Based on the student clicker use survey results, 33% of students would like to ‘click’

with their cell phones, 10% with their laptops or tablets, 23% prefer physical clickers and 34% would like to choose their device (BYOD). Instructors' preferences are rather different, with the instructor survey showing 35% of instructors favoring physical clickers, with the remainder favoring any device (BYOD). Many instructors do not allow the use of cell phones or laptops or tablets in class and thus require physical clickers - mobile/web only clicker systems are problematic for them<sup>5</sup>. This may change if vendors implement 'lockout' systems allowing web/mobile devices to access only the clicker system during class. This has been discussed but is not available currently and presents some problems.

Multiple clicker system purchases due to different systems being used in different courses, is a significant issue for students and for instructors. According to the student survey, 84% of reporting students have had to purchase 1 or more additional clickers or subscriptions for different brands, with 44% purchasing 3 or more additional clickers or subscriptions (there is some inconsistency in the responses and it is possible that students who purchased additional annual subscriptions to the same brand, or replacements for lost hardware clickers, included those in their answers). Two-thirds of student respondents felt that the need to purchase multiple clicker systems was a significant burden. The rest felt that it was not (25% felt not, or they barely noticed, 9% haven't had to do it). Instructors are concerned as well. 71% thought it a significant problem or a very significant problem for students, with 8% indicating that many students have complained about this. For students who were required to purchase more than one brand of clickers, the additional cost over their undergraduate years could range from \$14 to as much as \$150 depending on how many different brands were required in their courses, whether they purchased mobile/web subscription or a physical clicker and whether they purchased multi-year licenses. Note that many students report purchasing used devices (52%) and/or reselling theirs (18%), reducing the total costs somewhat. In comparison, the cost of textbooks to students have been estimated to be as high as \$1,200 per year (\$4,800 over four years)<sup>6</sup>.

While instructors do not pay for clickers directly, the decision to use clickers in their course is not cost-free to them. It requires considerable time to learn and master the system, developing and/or modifying content and incorporating it into the course structure, A required switch to a new system imposes substantial new costs on the instructor including the time and effort to learn the new system, the possible reduction in instructional effectiveness in using a system that they are less comfortable with and may find less suitable, the need to convert existing materials to the new system, and more. Some systems are more involved and require more effort to master and to maintain. Instructor opinions and tastes differ on this and thus different instructors choose different systems.

## **Support and Technical Issues**

Classroom use requires receivers for hardware clickers (iClicker and Turning Technologies) or Wi-Fi and/or cellular capabilities, or both. The receivers are either small, lightweight 'boxes' (iClicker) or USB dongles and can be carried by the instructor or installed by DCS in a podium. Both iClicker and Turning Technologies have PC and apple versions, although moving between them, as is required by an instructor using a pre-installed apple version on a classroom podium and a PC version on their office system, can be involved. Until recently, Wi-Fi service has been a problem in some classrooms, and has been the source of some student and instructor dissatisfaction. OIT has completed an upgrade and DCS indicates that Wi-Fi service should be adequate in all supported Rutgers-New Brunswick classrooms, although cellular service might face some bottlenecks.

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<sup>5</sup> <http://dx.doi.org/10.1080/87567555.2015.1005040> available through the Rutgers online Library system

<sup>6</sup> <http://www.dailytargum.com/article/2016/10/studies-find-cost-of-textbooks-has-risen-800-percent-in-30-years>

System reliability and accuracy is of concern to students, instructors and support staff. Some students and some instructors have complained about dropped clicks, unreliable scoring and other issues for each of the major systems in use at Rutgers-New Brunswick. As noted, some of this may have resulted from limited Wi-Fi capabilities in some classrooms, recent OIT upgrades are believed to have solved this for at least OIT maintained classrooms. Beyond connectivity, there have been concerns expressed about accuracy and reliability for each of the clicker systems. This can be a significant issue if clicker points are included in grades and this concern often dictates instructors' choice of the clicker brand they have adopted. A further concern voiced by some students and instructors results from the fact that web/mobile systems can to some degree, be used by students not physically in the classroom. There are evolving mechanisms (an attendance code displayed on the classroom screen, geo-fencing) for dealing with this.

Integration with our various LMSs (Sakai, Blackboard, Canvas) has been a problem for each system at times, but with the exception of Poll Everywhere, each seems to have resolved this for now. Upgrades to LMS and/or clicker software will bring this issue up periodically. This is likely the major support issue dealt with by technical staff.

Data security, especial FERPA compliance, and accessibility – meeting ADA standards, have recently gained well-deserved attention. The major systems in use at Rutgers-New Brunswick - iClicker, Turning Technologies, Poll Everywhere and Top Hat each indicate that they are compliant, and as noted above, have been found to be accessible and usable at the University by OIT specialists. Going forward, it will be important for any clicker system used at Rutgers meet accessibility and security standards.

Technical Support, primarily for LMS integration and student registration is provided by some combination of OIT, OIRT, CTAAR and for RBS, OTIS. DCS, OIRT and OIT technical staff have indicated no strong preferences for one system over another and no difficulty supporting any or all of the systems currently with a significant presence on campus. Limited training is also provided by some mix of these units. There appears to be no central online source of information on clickers and policies for Rutgers-New Brunswick. The only online resources currently are available are help documents for some of the systems.

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## Appendix B: Clickers at Other Universities

Other schools, especially our Big 10 peers, employ a variety of clicker systems and follow a number of different approaches ranging from no policy to University enterprise licensing - effectively providing 'free' clicker use for students and a strong incentive for instructors to use that system. Otherwise, none requires a specific brand. Some 'standardize' or 'support' one or more brands, meaning that they provide assistance, training and back end technical integration on these systems, but do not require their use. Seven of the fourteen Big 10 schools 'standardize' on just one system, and the remainder on two or more systems. Minnesota, Nebraska, Penn State, and Wisconsin standardize on iClicker only. Iowa and Northwestern show Turning Technologies as their sole standard. Ohio State and Indiana each show Top Hat as their only 'standard' clicker system, with Ohio State the only school with an enterprise license.

SCHOOL	POLICY	BRAND(S)
Indiana University	standard	TopHat
Michigan State University	supports	iClicker (REEF) and Top Hat
Northwestern University	standard	Turning Tech
Ohio State University	enterprise license	Top Hat
Penn State University	standard	iClicker
Purdue University	supports	Hotseat, iClicker
Rutgers University	none	iClicker, Turning Technologies, Poll Everywhere, Top Hat
University of Illinois	supports	iClicker and Turning Technologies
University of Iowa	supports	Turning Technologies
University of Maryland	standard	Turning Technologies
University of Michigan	none	iClicker, Poll Everywhere, Socrative, Echo360 (formerly LectureTools)
University of Minnesota	supports	iClicker
University of Nebraska	supports	iClicker
University of Wisconsin	standard	iClicker