Innovating toward Equity with Online Courses: Testing the Optimal “Blend” of In-Person Human Supports with Low-income Youth and Teachers in California

CREATE Equity Research Report 1

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Executive Summary

Background

In California, online self-education is key to one definition of “equity,” particularly for low-income youth. Especially in settings of high need and low opportunity, many scholars celebrate moments when youth teach themselves using computers, seemingly making a teacher or even physical schools seem unnecessary. So as we “blend” technology with in-person educational efforts, and especially as we consider teaching core school material to students who have been underserved or unsuccessful in schools, what should human instructors still be paid to do?

*Credit-bearing* online courses seem the holy grail of self-education, especially in California, and such courses raise particularly deep questions about both equity and the human teacher role in online education. While much excitement about student-driven, online self-teaching addresses out of school learning experiences (Ito et al 2013), to become college eligible, students still need to take and pass prescribed school courses for credit. More specifically, competitive college admissions in California rely on students accessing, then passing approved “A-G” and Advanced Placement (AP) courses, which low-income schools simply do not offer at equitable rates. Therefore, the University of California system has for years been offering credit-bearing, college-prep online courses (via a program newly called Scout) to help more students take classes to become eligible and competitive for college admission.

Scout courses are designed to support students to move through material with a high degree of independence. Still, UC requires that an associated teacher – local or remote – be hired to provide at least weekly assistance, at a minimum monitoring assignment completion, proctoring final exams, and offering lab sessions (in person supports are required for courses
requiring science labs). Beyond that, teachers can choose their level of interaction with young people. **The situation raises a particular unanswered question of equity-oriented efforts to blend in technology: What is the role of human instructors in supporting high-need students as they work through foundational material online to prepare for college?**

**Study Design**

This report shares results from a summer 2013 study, conducted in partnership with teachers, low-income students, and UC San Diego’s Early Academic Outreach Program (EAOP), in which we examined the *in-person* roles adult instructors took on during a blended enactment of Scout. More specifically, we studied 8 classrooms using Scout online coursework during the summer with low-income underserved students at four high schools in San Diego and Imperial Valley. Each class of students went through the Scout curriculum online on individual computers, and students were supported by a teacher and two teaching assistants. These courses served approximately 200 students total; offerings included AP Psychology, AP Environmental Science, Honors Sociology, Algebra I and Algebra II (Intermediate). UCSD EAOP and school employees recruited students for the summer courses. All the students were taking the courses for the first time, with the exception of the mathematics students who were repeating traditionally taught courses they had been unsuccessful in during the prior academic year. Qualitative methods were used to study the in-person supports adults in each room offered and students requested. Methods included focus groups, classroom observations (several times each week per class to capture adult-student and peer-to-peer dialogue), teacher interviews, student surveys, and curriculum analysis, to determine the range of in-person human roles within a blended enactment of UC Scout with high-need student populations. This study did not investigate remote human supports, one version of Scout’s model, because EAOP’s model prioritized in-person supports. A key question for next study, then, is which supports remote humans could and could not offer online.

**Summary of Findings**

Our overall findings focus on the in-person roles that humans played in the eight UC Scout courses offered across the four sites. We looked for patterns of behavior and interaction that generally cut across the classrooms, as well as the range and types of interactions that were distinct site to site. We found seven varieties of in-person human support that were frequent and notable:

- **Humans as fixers and explainers of technology:** Humans played an important role in making the online course accessible and hardware and internet-based links functional. This role was especially key in the first week of the courses because of unforeseen glitches with school firewalls or tech incompatibility, inhibiting access to UC Scout. Small and large tech glitches requiring local human assistance (and remote assistance from Scout’s central office) often continued here and there throughout the program.

- **Humans as digesters of content:** UC Scout curriculum is already succinct; subject matter is typically digested into short text, images, and animations. Still, the brevity of an intensive summer course resulted in humans playing key roles in further digesting content for
students, to speed up students’ ability to answer specific questions about the content quickly and accurately for Scout assessments. This digestion occurred in many forms, such as teachers, TAs, or students themselves preparing study guides or summaries of information for students to read or re-examine for test prep. To students, such help felt somewhat “necessary” in order to keep up successfully with the pace of the class, but participants also acknowledged that in some ways this digestion for students overstepped students’ actual needs.

- **Humans as explainers of content:** Teachers, TAs, and peers played important roles in explaining content beyond what UC Scout provided online. These kinds of explanations occurred one-on-one (between adult and student), in peer group or adult-student small group interactions, and in whole-class lecture and discussions. In this role, humans elaborated on key concepts students were expected to learn, and added examples to create a more accurate, nuanced, or personalized understanding of a course concept (e.g. “deviance” or “motor development”). Students felt that this type of extension of the course materials was often essential to deepening their understanding of the UC Scout materials.

- **Humans as extenders of content, toward application (p.35):** Adults in the room sometimes created opportunities for students to contemplate, extend, and share their learning, through writing additional reflective prompts or longer assignments, creating additional hands-on labs (or requiring writing in science notebooks), leading small group or whole-class discussions, and in some limited cases, requesting that students give in-class presentations to their peers. These activities often encouraged students to make deliberate connections between the “real world” (their lives and environment, or societal issues) and the concepts they were learning within the Scout coursework, with a particular focus on application. Teachers who embraced this role also sometimes used it to develop rapport with their students through discussion, and by weaving together the course materials with their students’ (and the teachers’) life experiences. While it remains unclear whether discussion toward application was essential for student comprehension, we know that students often noted that they did not fully understand the material until they discussed it and considered real-world applications of it.

- **Humans as providers of feedback and assessment:** Adults’ frequent feedback on student learning and their formative and summative assessment of students’ learning were particularly key in the math remedial courses, where students were all repeating course material. The role of human feedback was also somewhat apparent in courses where adults helped students redraft short writing assignments. But it was particularly essential in mathematics – and many of the supports provided seemed to depend on in-person interaction. In Algebra I and Algebra II, teachers and TAs prompted students who appeared confused, checked repeatedly for understanding (often before and after students “clicked submit”), diagnosed and remedied confusions or misunderstandings, and encouraged students to understand concepts more deeply. Teachers and TAs also worked to create, score and review with students additional materials (new problems, quizzes, homework assignments, and other formative assessments) to support students to practice material at greater length and to ascertain and backfill gaps in student knowledge.
unaddressed by the Scout course. By playing this role, the multiple adults in the room guided students through the course while closely monitoring students’ comprehension. We found in-person humans – both teachers and, TAs -- were necessary for some key forms of running feedback on student learning that Scout courses’ computers did not provide. Whether various such supports could occur remotely is a question for future research.

- **Humans as regulators of student behavior:** Most instructors urged students not to go further than one lesson ahead each day, as opposed to allowing students to fully self-regulate via the online curriculum. In some classes, humans spent far more time and energy getting students to move largely at the same pace (e.g., requiring that students simultaneously read material). This higher level of human regulation, which did not appear in all courses, did seem to thwart somewhat the potential for online instruction to allow students more flexibility to go at their own pace. However, some human-regulated pacing did seem a potentially necessary support mechanism for students given the summer speed, perhaps particularly for those who lacked study skills or content knowledge to finish the course fully at their own pace. Both students and teachers seemed to value a mix of regulation with freedom.

- **Humans as peer supporters:** Peers were a key support group for students, especially since EAOP had arranged classrooms to be places where students learned simultaneously in person. Whether students were digesting Scout curriculum on a shared computer screen, collaborating on an assignment, or discussing a concept that they collectively needed to understand more deeply, students leaned regularly on their peers (in addition to online resources – e.g., search engines and websites) as essential human support.

**Overall Statement of Findings:**

We found an overall necessary human role in Scout classes was the human as innovator of content and pedagogy, shifting teaching in response to students’ ongoing needs. We saw the importance of human creative innovation in taking learning deeper through in-the-moment discussion, explanation, extension, and application, and through ongoing verification of student comprehension. We also note that face-to-face humans encouraged students to go deeper in their learning experience than what the computer accepted. Humans prodded students to ask questions regarding any given topic rather than simply provide right answers. Humans also chose at times to override the online material’s explanation of content to explain material in ways they found more compelling or, to afford students additional practice opportunities. Humans supplemented (sometimes heavily) the computer’s material with different or additional learning experiences they thought would deepen students’ learning. Humans also extended course material to help students apply core concepts to real-world examples.

While Scout supplemented transcripts and provided solid content access, then, humans supplemented Scout’s baseline learning experience. While UC Scout curriculum provided the important equity backbone allowing students to access courses, content, and credit, the human support in the room helped further supplement each course’s learning experience, making those experiences deeper and more responsive for the students enrolled.
Yet for deep equity in education, the humans Scout requires to be associated with Scout courses need to be highly skilled at supplementing Scout with human-based learning experiences -- making connections to ideas not programmed in to the text, explaining material in ways not programmed in to the explanation, or discussing and debating concepts. Fully equipping learners may require the full engagement with material that only skilled humans can help provide.

Teachers and teaching assistants who supplemented Scout most productively were those familiar with the subject area, affording extensions, real-world examples, participatory discussions, formative assessment and, at times, tailored instruction.

Some of the roles humans took up were more essential than others. Digesting already succinct Scout material further for students was less critical, for instance, than extending Scout curriculum by providing deeper and applied learning experiences. Frequent formative assessment and feedback were vital to ensure student understanding before moving on; this was particularly true in mathematics.

As UC Scout enters a new decade of work and continues its important equity role by providing students greater access to UC-approved course work online, understanding the added value of human supporters to students' full learning experience is critical. Some students, including low-income students from under-resourced schools, can use Scout largely independently and successfully to move quickly and sequentially through core course material and assessments. But, the gold standard of Scout implementation and indeed, of online learning -- where students dive deeply into course concepts, synthesize, extend, and apply their learning, become curious about a field, or discover and fill key holes in what they know -- will likely require more flexible integration between humans and online course curriculum. Since supporting high-need students particularly is Scout's main goal, designers and users will have to navigate a classic core tension between balancing essential access to and completion of college-preparatory A-G courses and credit (basic equity) with ensuring the highest quality learning experience that will set students up well for future coursework (deep equity). Which such supports for deep learning of foundational material can be offered remotely is still to be determined. But use of UC Scout for full college preparation will be in human hands.
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If you're just confused, thank God! She's right around the corner, you can just go ask her. –Student, summer 2013

In California, online self-education is key to one definition of “equity,” particularly for low-income youth. Especially in settings of high need and low access to opportunity, many scholars celebrate moments when technology can assist youth to overcome academic barriers.

Low income youth use a variety of technologies to learn school material today, ranging from supplemental apps, videos, tutoring programs, collaboration tools, and games to full, credit-bearing online courses that can occur without face-to-face teaching. On this spectrum, courses that don’t seem to “need” face-to-face-teachers or even physical schools particularly excite some scholars, but they also highlight thorny economic and pedagogical questions about the human teaching role in online opportunities to learn. As we “blend” technology with in-person educational efforts, and especially as we consider teaching core school material to students who have been underserved or unsuccessful in schools, what should human instructors still be paid to do?

Credit-bearing online courses seem the holy grail of self-education, especially in California, and such courses raise particularly deep questions about both equity and the human teacher role in online education. While much excitement about student-driven, online self-teaching addresses out of school learning experiences (Ito et al 2013), to become college eligible, students still need to take and pass prescribed courses for credit. More specifically, competitive college admissions in California rely on students accessing, then passing approved “A-G” and Advanced Placement (AP) courses, which low-income schools simply do not offer at equitable rates. Therefore, the University of California system has for years been offering credit-bearing, college-prep online courses (via a program newly called Scout) to help more students take classes to become eligible and competitive for college admission.

Scout courses are designed to support students to move through material with a high degree of independence. Still, UC requires that an associated teacher – local or remote – be hired to provide at least weekly assistance, at a minimum monitoring assignment completion, proctoring final exams, and offering lab sessions (in person supports are required for courses requiring science labs). Beyond that, teachers can choose their level of interaction with young people. The situation raises a particular unanswered question of equity-oriented efforts to blend in technology: What is the role of human instructors in supporting high-need students as they work through foundational material online to prepare for college?

This report shares results from a summer 2013 study, conducted in partnership with teachers, low-income students, and our university’s Early Academic Outreach Program (EAOP), in which we examined the in-person roles adults took on when offering online, UC made and approved, AP, honors, and A-G courses to underserved students in summer San Diego area classrooms. This study did not investigate remote human supports, one version of Scout’s model, because EAOP’s model prioritized in-person supports. A key question for next study, then, is which supports remote humans could and could not offer online.
In this study, we tackle questions of what equity in online coursework means, exploring a classic core tension between balancing more open access to content and credit (here, to the opportunity to become eligible for college) with the quest to support deep opportunities to learn (here, supports allowing students to succeed on college material as well as get there). We argue that those seeking to ensure the full possible equity impact of an online learning experience for underserved students hoping to attend and succeed in college must consider head-on whether, when and how support from human instructors is needed in person.

**Online courses in the California K12 course economy**

For years, California’s K12 schools and universities have experimented with fully tech-based online courses as a way to offer more students access to coursework or to extend the school day or year. The online classroom is in theory infinitely large; enrollment in such courses can be more flexible. And if online courses count for credit in the accepted course economy, they might increase fundamental opportunities for students to both graduate and become competitive for next steps.

Within the University of California system, university officials have been implementing both face-to-face courses supplemented with technology and fully online credit-bearing coursework. Some hail online coursework as an economic solution to a face-to-face teaching model, which our Lieutenant Governor recently called “not sustainable” (Rosenhall, 2013). While many are excited about testing technology’s potential for improving learning in UC classes, large and small, other groups¹ see the turn to largely online courses as a thinly veiled attempt to cut even more human instructors from public higher education budgets. The same debate percolates in K12 education: teachers tell of technologies purchased and teachers laid off. Yet too few studies have attended directly to an underlying equity question in this heated debate. What role should human instructors play in online education, particularly in person -- and particularly in teaching foundational material to students who have been underserved or unsuccessful in schools?

For students at risk of not making it to or through college at all, the debate is particularly high-stakes. In California, and in our region of San Diego, low-income students are typically the least likely to have access to high numbers and a variety of A-G approved courses that will count toward college eligibility, particularly in elective areas or non-traditional STEM courses (SDUSD, 2011; see box below). Low-income students are also far less likely to access sufficient numbers of AP or honors courses, now key for weighted grade points that can catapult students’ grade-point

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¹ At the UCs, various groups (most recently the Philosophy Department at San Jose State; Kolowich 2013) have recently critiqued what they interpret to be a veiled attempt to replace “expensive” human teachers with speculatively cheaper online content provision in the name of equity. Reacting to a request to add a Harvard professor’s premade online course to their roster, professors argued explicitly that low-income students and their teachers would be disadvantaged, not advantaged, by a plan reducing or replacing face-to-face instruction. While higher-income students face to face with the actual professor would have higher-quality, question-and-answer sessions, they argued, local professors supporting lower-income students through pre-made online material would become reduced to glorified TAs (Kolowich, 2013). Their statement, spread virally on the Internet, asked pointed questions about achieving equity with online tools – and specifically, about the human role in online courses.
averages into competitive ranges for college admissions (Orfield et al., 2011). Few students now get coveted spots in freshmen admission within UC or CSU colleges without taking at least some honors or AP courses during their high school years. At UC San Diego in 2011, for instance, 70% of the 2011 freshmen at UCSD had taken 1 or more honors or AP courses during their 10th and 11th grade years alone (Armstrong, Carty, Martin, and Thonton, 2011). Moreover, these high-achieving students had experienced a variety of college prep classes at their schools: 94% of the freshmen cohort had taken over 41 college-preparatory A-G courses with 39% taking more than 50. In addition to thinner course offerings, systems serving low-income students also notoriously have fewer experienced teachers and higher student-teacher ratios, and lack budgets and/or qualified instructional staff to offer a necessary course range or to target additional courses to students when they falter. A recent study conducted by our colleagues at the UCSD SANDERA group found that within the San Diego Unified School District, approximately 20% of students who failed to finish the "A-G" actually failed to finish in mathematics, and that students struggled to complete Algebra II (also known as Intermediate Algebra) in particular (Betts, et al, 2013).

College-Prep Requirements in California

To be eligible for UC and CSU systems’ admissions, California students must take and pass a series of courses designated “A-G” by an internal UC board. Courses not designated “A-G” literally do not count toward college admission.

<table>
<thead>
<tr>
<th>A-G Subject Area</th>
<th>Required Amount</th>
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<tbody>
<tr>
<td>A History/Social Science</td>
<td>2 years</td>
</tr>
<tr>
<td>B English</td>
<td>4 years</td>
</tr>
<tr>
<td>C Mathematics</td>
<td>3 years (4 recommended)</td>
</tr>
<tr>
<td>D Laboratory Science</td>
<td>2 years (3 recommended)</td>
</tr>
<tr>
<td>E Language other than English</td>
<td>2 years (or equivalent)</td>
</tr>
</tbody>
</table>

2 The average incoming GPA at UC San Diego (UCSD) was recently a 4.00, meaning that many of UCSD’s admitted students took weighted honors and AP courses bumping their grade over the maximum 4.00. At UCSD in 2012, 21.5% of admitted students had taken over four AP or honors courses in 10th and 11th grade (UCSD, 2012)
<table>
<thead>
<tr>
<th></th>
<th>Visual and Performing Arts</th>
<th>1 year</th>
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<td>G</td>
<td>College Preparatory Elective</td>
<td>1 year</td>
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Typically, in a time-consuming, multi-institutional process of getting an existing high school course to count as A-G, schools submit course syllabi to their district, which compiles and submits them to the university system annually for review. Under-resourced or rotating counselors and administrators often do not understand the procedures for getting such courses officially approved. Glitches in this process can leave students at risk of not securing A-G credit. If a course is not submitted through the proper channels, in the proper format, with sufficient information, and within strict deadlines, the course could be rejected for that year and students who enroll in it are at risk of not securing A-G credit come college application time. Preapproved A-G courses can also mean more high school graduation: increasingly, sizeable high school districts (such as The Unified School Districts of San Diego, San Francisco, Oakland, and Los Angeles, and numerous other smaller districts) are mandating that students complete the “A-G” courses before being handed their high school diplomas. By 2016, tens of thousands of California seniors’ diplomas will be contingent on taking and passing the baseline “A-G.”

So, expanding access for low-income students to online preapproved and accelerated courses, which in theory can be taken anywhere a student has access to a computer and the internet, could literally support more access to and eligibility for public, four-year higher education in California. And for over a decade, the University of California has been producing such online courses for high school students in the name of equity.

Formerly known as the University of California College Prep (UCCP) initiative, today, the “UC Scout” program is housed at UC Santa Cruz Extension. Scout offers an online portal through which K12 schools and students can access UC “A-G” (college prep) approved, AP and honors courses online. Founded in 1999 as part of the University of California’s SAPEP (Student Academic Preparation and Educational Partnership) outreach portfolio, UC Scout (formerly UCCP) has offered a range of over 25 online “A-G” courses to approximately 80,000 students a year in California alone.

UC Scout presents its materials in the form of complete online courses – college-prep courses in a box -- available for the choosing. Scout allows individuals and schools to tap the online curriculum for free as supplements to teachers’ existing curricula, but the most potentially game-changing use of these online materials has been to provide students full, credit-bearing, weighted courses toward UC eligibility. Schools can give students A-G, college-preparatory approved credit for successfully completing Scout’s online coursework.
UC Scout courses fit a fundamentally UC-made economy: they are made by UC and pre-approved by UC as courses that count for freshman admission to the University of California and Cal State University (CSU) systems. UC Scout courses are also populated with preapproved AP-designated and honors course offerings. Scout offers 11 AP courses currently (mainly science, mathematics, and social science courses) and plans on adding more soon, including English Language and Literature for the first time.

Scout also offers students and schools potential flexibility with course timing and enrollment. Typical secondary school courses require minimum enrollments to be economically feasible. Scout courses can be offered to individuals or small groups of students. Since online coursework could be self-paced, courses also could potentially be offered to students in variable chunks of extended learning time after school, on weekends or in the summer, potentially making courses more accessible in a flexible way or, opening time in the school year for other things.

Scout thus offers flexible currency made-to-order for California's course economy. But to actually become college-eligible, students need to pass A-G courses—and to become competitively eligible for the state's top public universities, they have to pass these courses with high grades. Moreover, to perform well once entering college, students must learn deeply the materials they have studied, particularly in subjects that they are likely to encounter again at the collegiate level. To fully achieve equity in college preparation, then, Scout courses need to be not just available, but well-instructed—by the computer and with any human involvement.

In 2012, after open access to online UCCP courses had resulted in difficulty in tracking usage and effectiveness, UC Scout consolidated into a single new learning management system and began a process of updating all course materials, including efforts to align online materials with new Common Core State Standards. Anyone can still tap Scout material for free, but schools decide formally how, and whether, to add this resource to their roster of available credit-bearing courses -- including if, how and when to employ a local teacher vs a remote one. Districts and schools are the final determiner as to whether or not a Scout course will “count” for credit on their students’ transcripts, and to offer credit, schools offering Scout courses must choose how to involve a human instructor to oversee students’ completion of the course. Scout requires that a credentialed teacher must be paid to verify students’ completion of Scout assignments and to grade open-response material not automatically graded by computer. Teachers can add to that basic requirement however they and administrators choose. And here, questions of achieving deep equity arise, through decisions about the human role.

This study set out to explore these issues. Scout is under ongoing redesign, with new courses under various states of development and some courses sun-setting. This study sought to support UC Scout formatively as it redesigns internally to support equity effort in California. Our goal was less to evaluate Scout itself than to consider the in-person human role in offering it for credit in real settings with high-need students preparing for college.

**UC Scout: Virtual or Blended?**
Scout courses allow students to take classes individually or in groups. The courses rarely require students to work with peers. Some courses provide limited tools for group activity that could occur either online or in-person (such as one supplemental activity in new summer 2013 Algebra courses that expected group work on a hypothetical business plan). But most Scout material thus far is designed for individual students to access solo. Participating students can theoretically move through Scout material largely alone, reading text passages, watching videos and animations, and taking online assessments (typically multiple choice quizzes, short answer “discussion questions” to be graded by a teacher remote or local, and some longer multiple-choice or open-answer exams).

Districts and schools are the final determiner as to whether or not a Scout course will “count” for credit on their students’ transcripts, and to offer credit, schools offering Scout courses must choose how to involve a human instructor to oversee students’ completion of the course. In all cases, some credentialed teacher will be paid to help monitor any credit-bearing Scout course either remotely or in person. Remote or in-person, the teachers’ primary roles are to verify students’ completion of Scout assignments and, in some cases, to grade open-response material not automatically graded by computer. Teachers can add to that basic requirement however they and administrators choose.

Scout requires that a credentialed teacher be assigned to each credit-bearing course. Scout supports two basic models of involving human teachers:

1) Districts/schools can assign and pay their own teacher to monitor a Scout course. In this scenario, the school pays a small fee (currently $99) per course to Scout for use of the learning management system (LMS). This locally chosen teacher can then decide how to support students working through the course. Teachers can serve basically as monitors and graders of non-automated assessments, or engage students through any form of in-person support or, online support via the LMS.

2) Districts/schools can assign a course’s students to a fully online instructor hired by Scout. In this scenario, districts/schools or individual parents pay the current fee of $149 per student for each remote course. The students attend class virtually and may be “in class” with students from elsewhere also enrolled in this virtual classroom. Fully remote teachers too can determine their level of involvement: they can primarily assess assignments’ completion or quality, provide on-demand support or, engage more routinely or intensively. Scout requires that online instructors meet with students a minimum of once a week and hold regular office hours with students as well (Mercer, 2014).

For specific courses, such as laboratory science courses, Scout also requires (per A-G requirements) that 20% of the course have a face-to-face instructor supervising and teaching the laboratory component. How that 20% is calculated, as topics or time, or how or where lab instruction occurs, is to be determined by the school site and teacher (Mercer, 2013).

Again, Scout courses – with the exception of the laboratory science courses’ required 20% of in-person labs -- are designed to include all necessary instruction “inside” them. They include a
variety of types of regular and digital text (demonstrated in images below) and many automated multiple-choice assessments. Some courses also include open-answer questions to be graded by a remote or in-person teacher. Scout is clear, however, that the credit-granting institution – meaning the school or district, not Scout – determines how all coursework, labs, assignments and exams are implemented. Whether humans do anything other than grade is up to each instructional situation. In each case, the humans involved – teachers, and those who assess them – will decide the human role in online learning.

Scout thus provides an important context for exploring potential human roles in supporting credit-bearing online instruction in core school subjects, particularly for students who have been underserved or unsuccessful in schools. For students who often have lacked access to courses that accelerate them toward college, when and how are human teachers necessary for supporting computer-based introductions to foundational school content? For those students who have struggled in school, are human beings necessary for instructional supports of particular kinds, online or in person? Must these humans be knowledgeable in particular ways, or might computers supplement local gaps in expertise? In essence, as K12 schools and programs (and even colleges and universities) decide whether and how to supplement schools’ face to face offerings with online offerings, providers also need to decide how much to supplement online offerings with human supports -- when to do so, for whom to do so, and why. We addressed these questions using UC Scout as a case study.

**Enacting a Blended Version of Scout in San Diego and Imperial Valley Area High Schools**

**Background**

Colleagues from UC San Diego’s Early Academic Outreach Program (EAOP) have been experimenting with Scout implementation for nearly ten years. The UC San Diego EAOP, under the leadership of Director Rafael Hernandez and Assistant Director Thomas Gilkison, began cutting-edge work years ago to offer then-UCCP courses to their targeted EAOP students in the summer. EAOP works with high school students in low-income and rural areas who are either on-track or nearly on-track to complete their A-G course work. EAOP works to motivate and support students to apply to four-year colleges. Hernandez and Gilkison’s goal in offering these courses was a pragmatic equity motive: providing access to weighted credit and rigorous content for low-income students who otherwise would not have access.

As staff recalled, UCSD’s EAOP at the time was redoubling its efforts to support students through direct “academic preparation” for low-income students, in addition to giving them college-prep information. The then-UCCP courses seemed a pragmatic solution to a local lack of opportunities to learn. EAOP reasoned that by offering students free, accelerated, credit-bearing courses (paid for by EAOP and, at times, by schools) away from the summer heat, EAOP could help give students a leg up on their transcripts. Further, students would get access to AP and Honors curriculum unavailable at their schools given cutbacks in education budgets gutting all but remedial summer school courses. Students who took Scout courses in the summer also could enjoy the dual advantage of freed-up course space for more courses during the regular year. A
participating principal explained that many rural students, immigrants themselves, needed extra college preparation courses after early years spent in English instruction course that were not “A-G.” Courses could thus support students to be not just eligible but competitively eligible for college.

In its multi-year implementation of these courses, EAOP has become committed to a “blended” implementation: the need for teachers and tutors with subject matter expertise to support youth through the online material in person and in various ways. EAOP tried a remote teacher in early UCCP courses, but staff and participating students tired of communicating slowly with the teacher through email, phone or fax. When UCCP then just offered the curriculum freely online, UCSD’s EAOP downloaded it all for their summer programs but found next that students asked to take the online courses alone from home “just didn’t go on.” EAOP next put students together to take a course in a room with a counselor. Without an experienced teacher present, students wound up asking questions of EAOP staff who had majored in the subject area. Through this experience, EAOP came to assume that even if a Scout “course in a box” provides immediate access to UC-approved material, students would have a higher quality learning experience when not left “alone with the computer” or even with a remote instructor.

Today, EAOP has roughly 30 to 35 students take each summer school Scout course together (on individual computers) in a room with a teacher plus two undergraduate-level teaching assistants. EAOP also has offered students the option to access online tutoring from remote undergraduates physically at UCSD. In both rural and urban contexts, EAOP students – all low-income youth, most students of color and immigrants’ children -- have completed nearly 1000 online college-prep courses, at a rough cost to EAOP of $250 per student per course. (Thus, the additional in-person human support adds $100/student to the typical cost of accessing a remote, Scout-hired teacher.) While schools have sometimes paid for their own teachers, EAOP has typically paid for the adults in the room. Because EAOP is a UC program, UCCP/Scout waives any per course fee.

In 2013, as interest in scaling Scout built across UCOP, UCSD’s EAOP wanted to know: was EAOP correct in paying for humans (educators and tutors) to support students in person through courses whose premade curriculum was largely online? What precisely, if at all, were humans in the room needed for? Could students in fact succeed in the courses without face-to-face adult help? And what were the effects of taking these courses on students’ academic pathways and preparation, EAOP’s core concern?

During the summer of 2013, we (a research team out of UCSD’s Center for Research on Educational Equity, Assessment, and Teaching Excellence, in collaboration with our EAOP colleagues) studied eight Scout courses held in four school sites, all of which serve predominantly low-income students.

**Course Offerings Table**

<table>
<thead>
<tr>
<th>Imperial County</th>
<th>San Diego County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site A</td>
<td>Site C</td>
</tr>
</tbody>
</table>
* Offered via UCSD EAOP moodle, will be offered on UC SCOUT 2013-2014 with few anticipated changes
** Course grandfathered in via EAOP’s moodle in summer 2013, but discontinued on UC SCOUT as of 2013-2014.

Two sites in the Imperial Valley east of San Diego offered five Scout-approved A-G honors or AP courses (AP Environmental Science, AP Psychology, and Honors Sociology) to students from three high schools. These students were generally on-track for college. With Scout’s permission, these sites utilized an earlier downloaded version of UCCP material offered for multiple previous years by EAOP. The courses were hosted on EAOP’s own Moodle (free online learning management system, or LMS). Scout was simultaneously updating these courses with additional animations and visuals for a fall 2014 “launch” on Scout’s own LMS (though Scout later decided not to reinstate Honors Sociology).

Two additional urban school sites in the San Diego Unified School District offered, respectively, one AP Psychology course (also using the older UCCP course on an EAOP Moodle) and two new Scout courses, A-G Algebra I and Intermediate Algebra (hot off the press and offered using Scout’s new Learning Management System). The new Scout Algebra courses were also our only example of a “remedial” rather than accelerated offering, offered to repeating students hoping to get back on track for college eligibility and high school graduation. In total, the five Imperial Valley courses reached 118 students from three high schools; 34 students from two high schools experienced the two urban San Diego courses.

Across the courses, EAOP’s intensive acceleration dose of Scout offered students up to a year of college prep credit for one course taken over five weeks of up to 7.5 hour days. Typical four-hour/day summer school taught in person might offer students two intensive semesters of credit recovery in two subjects, often taught by two separate teachers. Students in the Scout course took a single course for up to 7.5 hours daily, with potential support from a credentialed teacher and two assistants, plus the opportunity to access online tutors and EAOP staff themselves to troubleshoot. Costs overall for the courses + combination of human supports: $7,500-9,000K per class depending on the hourly rate of the instructor according to experience.

**Research Questions**
Together with EAOP staff and participating teachers and students, then, we tested various teachers’ models of “blending” face-to-face human supports alongside online provision of content. Online “instruction” was solely from the computer itself.

We stress that EAOP’s human instructional supports occurred almost exclusively in person. Importantly, while a key Scout model will be to offer these courses with a remote supporting teacher and remote set of online peers, in this study we did not see or test online human dialogue because EAOP courses didn’t allow it. At the request of teachers who experienced prior summers where students spent time teasing each other, competing or cheating via online dialogue, EAOP left any chat function on the Moodle off in summer 2013. Online grading occurred with teachers behind desks a few feet away; more elaborated input from teachers and all peer support occurred face-to-face. If students did work on their own computers after school at home (which was relatively rare, and expected only in one of the eight classes, over weekends), they were reading content and doing assessments online, not conversing online with teacher, teaching assistants or peers. Online undergraduate tutors were rarely accessed, in part, we believe, due to under advertising of their services (see also footnote 3). In the end, we did not test remote tutoring in any detail and hope to as part of a subsequent study.

In summer 2013, we asked the following research questions:

1. In classrooms using online AP/Honors/A-G courses to support low-income students in particular, what is the appropriate and necessary level of balance between online (computer) and face-to-face instruction?
2. What types of supports are essential and what types are optional in order for students to be successful?
3. What is the academic impact of participating in such extended learning opportunities, for student participants’ college pathways? Specifically, what is the impact on students’ academic readiness and competitive eligibility for college?

During this study, as we explored how in-person human beings were “necessary” or “not necessary” alongside the online provision of material, we came to explore additional questions of what equity in online coursework truly means. We understood Scout’s most obvious benefit to be course credit access -- repairing or enhancing student transcripts toward eligibility for University of California admissions. Scout’s other benefit was in the realm of content access: courses introduced students to key UC-vetted material from the social sciences, science, and mathematics disciplines. But we also came to want to know how Scout might provide a quality learning experience, and we debated throughout how to define such an experience, particularly for underrepresented minority students and low-income students hoping to attend and then succeed in college.

We note that in each of the courses, participating students spent many hours a day filling gaps in their transcripts toward college eligibility, rather than what they said they’d otherwise be doing – sitting at home (for some in 100+ degree heat) or working low-wage jobs. What they also did not do during these hours, of course, was take high-end internships in medical labs, program computers side by side with engineers, or engage in elite enrichment in the arts or sports -- the sorts of activities some of their middle- and upper-middle class counterparts were doing in the
San Diego area. What they did, essentially, was spend the summer filling gaps or otherwise enhancing their college preparatory transcripts, by accessing previously unavailable subject areas for credit. Our question was the role of in-person human beings in this journey.

Methods and Data Sources

EAOP primarily serves communities that fit the following description:

- Low Family Income
- Enrollment/current attendance at a school with limited college preparatory curriculum
- Member of first generation in one’s family to attend college
- Residence in a community with low college going rates
- Attendance at a school with below average SAT/ACT exam scores.

All of the schools in the study were Title I schools, with a high percentage (roughly 70-90%) of economically disadvantaged students. A large percentage of participating students also were first generation college hopefuls.

All participating students were EAOP students who volunteered to enroll in the summer courses. In the remedial Algebra I/II program, EAOP did several weeks of heavy work to recruit students to take (or repeat) the courses. In the other courses, EAOP offered all students associated with EAOP the chance to sign up, and local teachers helped spread the word; Imperial Valley courses were oversubscribed.

In introductory presentations as the courses began, participating students and teachers were then asked to participate in the summer research study described here, with the caveat that such participation was not required in order to participate in the course. Interested students filled out parent permissions (teachers signed for themselves) and all approved participants were invited into a series of methods designed to tap their experiences of the course. Students who chose to participate in the full combination of methods received Starbucks gift cards and certificates of participation as thank-you gifts.

The study was thus both a typical research project conducted by observing researchers and a participatory design research partnership (Pollock 2013, Penuel, Fishman, Cheng, & Sabelli, 2011; Dede, 2005; Joseph, 2004) with teachers, students, and EAOP. Our explicitly stated goal was to look together at the experience of taking and teaching online college preparatory courses developed by the University of California and implemented by EAOP and the K-12 educators and students. Participating undergraduate and graduate researchers and faculty (the authors) invited EAOP staff, teachers and students to comment throughout on our research questions and on the courses, needed supports, and needed adjustments.

In the spirit of design research (Penuel et al., 2011), EAOP partners also iterated solutions to snags (particularly regarding technology) in real time, sometimes with researchers’ help; mostly, however, we examined classes without researcher interference. Researchers observed
classrooms to analyze patterns of adult-student interaction, interviewed and conducted focus groups with students, tutors and teachers to explore the supports offered, and surveyed students online to capture the types of help they needed and experienced (or didn’t) from the others in the room (see Appendix A for examples).

As a team, we then coded our data for patterns using the core grounded tactics of qualitative research (Lofland & Lofland 1995; Emerson et al., 1995). Much of our data was discourse – adults and students talking 1-1, in small groups, or in a full class dialogue.

<table>
<thead>
<tr>
<th>Data Collection Methods</th>
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<tbody>
<tr>
<td><strong>Online Surveys</strong></td>
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<tr>
<td><strong>Formal and Informal Interviews</strong></td>
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<td><strong>Classroom Observations</strong></td>
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<td><strong>Audio Recordings</strong></td>
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<tr>
<td><strong>Focus Groups</strong></td>
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</table>

Upcoming quantitative analyses will explore GPA and A-G course completion trends across EAOP students who took these courses versus a demographically comparable group of students who did not.

In the remainder of this report, we share insights on key in-person human support roles found in the Scout classes. Throughout, we tap our data to consider whether each form of human support was “necessary,” optional, or even unhelpful to students’ success.

**Conceptualizing Student Support in “Blended Learning”**

Blended learning, sometimes called “hybrid learning,” can be defined as “any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path, and/or pace” (Horn & Staker, 2011). While the word “supervised” in this definition alludes to a human instructor, the human role in “blended learning” is left undefined. Research also provides no consensus on whether “blended/hybrid” coursework, fully online coursework, or fully face-to-face instruction lead to better student outcomes.
In this study, we envisioned students with a series of computer-based, paper-based, and human “aides” that they could lean on at any point:

**Image 1: Conceptualizing possible supports in blended learning environments**

So, we asked, which supports did students taking Scout courses lean on, when?

Of course, individual students varied in how they accessed different types of assistance. Surveys printed below (and in Appendix A) demonstrate that students had many questions in every course; but a few students in every classroom plowed through courses largely alone, some answering their own questions via Google, while others asked adults or peers around them questions regularly. Individual teachers also had different preferences for providing supports. Some teachers or teaching assistants engaged students in hours of full-group discussion, while others largely sat grading while students worked. Others helped students use paper study guides as primary supports. Still others offered 1-1 verbal help throughout each day, roaming repeatedly through classrooms and honing in on struggles of particular individuals whether initiated by students or not.

In these courses, Scout’s learning task, plus the summer school context, also fundamentally shaped students’ help seeking. The goal across the courses was rapidly covering core content
toward correct answers on assessments. The four AP courses’ design and pace matched the traditional learning goal of AP generally: accessing large quantities of content for AP test mastery. Two honors courses’ learning task was also a broad content introduction. While the Algebra courses were being used with repeating students remediating prior misunderstandings or failures in math, rapid coverage of core Algebra skills and content was similarly paramount. So, help-seeking interactions in classrooms were primarily shaped by the learning task of rapidly completing course material toward assessments. Most student time in class was spent reading or viewing content in sequence from screens or printed PDFs, filling out paper study guides (in some classes), and (in all classes) taking multiple-choice or short-answer assessments graded by computer or by teacher and TAs, while leaning on the human aides in Image 1 (or, the internet) for correct answers. But some in-person teachers and teachers’ aides – particularly, those more experienced with the courses or the subject area -- went far above and beyond such basic “right answer” support to enable discussion, debate and back-and-forth inquiry with students, to support a deeper learning experience they found necessary for student learning.

An aide not tapped much in summer 2013 was online tutors: While EAOP made online tutors available, students said they rarely accessed them and in many cases said they forgot tutors were available. We chalked some of this up to inadequate advertising of tutor assistance, but students did explain in several cases that the tutors (whom they’d never met) couldn’t help provide right answers quickly or, that it was harder to ask questions in writing than verbally.\(^3\) However, we did not test online tutoring in any real depth in this study.

In the remainder of the report, we document seven key ways that on-site humans supported students in realizing – or extending -- the learning task of understanding the computer’s content toward right answers on brief Scout assessments. In our analysis, we came to name the following core versions of human support, some of which participants called more “necessary” than others:

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\(^3\) One teacher reported that students found available online tutors less helpful than face-to-face TAs:

Teacher: The online TAs, they only used them a few times but the students that did use them, enjoyed it because it was like having a person in the room but there also were problems with the online TAs. They felt like they weren’t getting answered quick enough. So whereas in a classroom you raise your hand and get your question answered immediately, online it can take two or three minutes. But for a student sitting there for two or three minutes, that seems like a lifetime for an answer, because the teacher would never pause for three minutes.

As several students put it in different focus groups, explaining what one needed help on – or getting help -- was also harder in writing, an issue that research on online uses of Scout could further explore. One student noted of the online tutors, “I think it’s more difficult trying to understand what they write, cuz it’s harder to explain through the computer than in person.” Another argued that with face-to-face help from TAs, “it’s easier to explain in words and showing them, than typing and trying to explain what you’re trying to figure out.” Another added, “I can’t really explain what I wanna say by writing, so it’s difficult to work with an online tutor.” And yet another student suggested that writing aside, “having them next to you, I don’t know, I just think it’s easier when they’re here.”
Humans as fixers/explainers of technology
Humans as digesters of content
Humans as explainers of content
Humans as extenders of content, toward application
Human as providers of feedback and assessment
Humans as regulators of the learning experience
Human peers as supporters of the learning experience

Throughout these subsections, we also explore a form of human support found at times throughout the classes: **humans as caretakers of student well being and motivation.** We also explore an overarching form of human support found: **humans as innovators of content and pedagogy,** shifting teaching strategies as needed to ensure students understood and engaged with material.

In the following discussion, we consider which such supports from humans were “necessary” and which “optional.” We offer several case studies presenting a key human role that characterized a classroom. In other cases, we illustrate a key human role with comparative examples from multiple classes.

**Varieties of Human Support**

**Humans as fixers and explainers of technology**

On any given day in the Scout courses, tech glitches occurred that on-site humans were required to fix. Glitches included broken or frozen links (e.g., a census website that was too slow to access during class) or, videos or animations that would not load on all or some computers. One teacher noted that links to online material required regular troubleshooting. At many of the sites, both on the older Moodle-based courses and on the newer Scout courses, students on surveys described reaching out to the teacher, TAs, or other students for tech help, reporting programs that crashed or tests that didn’t accept answers:

> I needed help with getting on the stress test website and a classmate helped me get to it

> I needed help getting into this website. Ms.N helped me get in

Sometimes, knowledgeable students came to the teacher’s rescue to solve tech glitches: In one case, a student stayed in the classroom during the break to install necessary Google Chrome and Java on three computers so simulations could work. ⁴

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⁴ The Scout office at UC Santa Cruz responded to several requests as well: during the first week of the algebra courses, for example, students received an error message when trying to access a Scout lesson. The teacher tried to contact the Scout representative for two days, before sending an email reaching out to EAOP and CREATE staff for help. The issue was resolved later that day by Scout IT staff.
Some of the problems related to technology were relatively minor and due to a lack of equipment, hardware or software rather than issues with the Scout site. Humans could fix these issues relatively quickly without ongoing disruption to the learning experience. For example, on day one, the algebra teacher and TAs realized that the classroom lacked headphones. As a result, students without headphones could only listen to the lesson audio quietly through external speakers on the computer. After class, EAOP purchased headphones, and the next day students who did not have any received a pair.

Other tech problems were more disruptive to teaching and learning. For instance, early on in the course, it was also discovered that the videos for Algebra II were unable to load on most of the assigned room’s computers. CREATE researchers and EAOP staff worked together to try to figure out if it was a browser or plug-in issue, but after a long day with no site video access, the team was unsuccessful at diagnosing the problem. As a result, the class had to relocate entirely and began meeting in a different room, with computers able to load the Algebra II videos.

Some tech issues were inherent to the tool’s developing design: for example, the Algebra I and II UC Scout programs automatically graded computer-generated homework assignments, but failed to then send student scores directly to the teacher. The situation prompted TAs and teacher to walk around and read them off the screen or to hand grade.

**Humans as digesters of content**

Scout content was already succinct; subject matter was typically digested into screen-size text chunks or images. For example, the AP Environmental Science course began units with a short digest of what students would learn, such as “define carrying capacity and compare its determinants in human and nonhuman populations.” Then, students were directed to short lessons to read, such as this:
INTRODUCTION

The human carrying capacity is a concept explored by many people, most famously Thomas Robert Malthus (1766 - 1834), for hundreds of years. Carrying capacity, "K," refers to the number of individuals of a population that can be sustained indefinitely by a given area. At carrying capacity, the population will have an impact on the resources of the given area, but not to the point where the area can no longer sustain the population. Just as a population of wildebeest or algae has a carrying capacity, so does a human population.

Some courses asked students to read passages in an accompanying physical textbook. The courses also often directed students to watch a brief animation that would explain concepts with a voiceover and several static or animated images:

In this case, a 3-minute video of a woman explained “carrying capacity” verbally again, with her voiceover interspersed with static images:
Sometimes, students were presented with brief animated lessons, like these:

**Algebra II**

**Evaluating and Simplifying Algebraic Expressions**

**Show Me**

Simplify and evaluate: \( x^2 + 2x + y + 3x^2 − 3x \)

for \( x = -2 \) and \( y = \frac{1}{2} \).

**Step 1**

\[
\begin{align*}
x^2 + 2x + y + 3x^2 − 3x &= \text{Use the Commutative and Associative Properties of Addition to collect the like terms.} \\
x^2 + 3x^2 + 2x − 3x + y &
\end{align*}
\]

**Step 2**

Let's look at the steps involved in simplifying and evaluating the following expression when \( x = -2 \) and \( y \) equals one-half.

Our first step is to use the Commutative and Associative Properties of Addition to collect the like terms.

Then we combine the like terms by adding their coefficients.

Next, substitute \(-2\) into the
Students were at times encouraged to follow links to an external website with additional brief information:

But in-person humans also played a key role in further digesting material for students. For example, teachers and TAs picked out online material of particular importance to upcoming assessments. When prepping for class, one teacher said, “I’ll go in the computer ... review which sections are gonna be important or pertinent to read... have those ready.”

Routine quizzes in the courses gave students 30 minutes to answer 20 multiple-choice questions graded by the computer. In preparation for these and longer multiple-choice assessments, both teachers and students also digested the courses’ content into Q & A on study guides, some kept and used year to year. A student-made study guide in AP Environmental Science looked like this:
In focus groups, several students discussed how the study guides in AP Environmental Science had digested material toward finding right answers. Some guides anticipated tests’ more complex language and guided students through the essence of material presented. Given the course pace and quantity of reading, students said they appreciated the study guides and felt that they were necessary for passing the tests in order to get a good grade:

<table>
<thead>
<tr>
<th>Question</th>
<th>Study Guide Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-What did Thomas Malthus study?</td>
<td>Human Population</td>
</tr>
<tr>
<td>2-What did Malthus write?</td>
<td></td>
</tr>
<tr>
<td>3-The human carrying capacity of Earth is</td>
<td></td>
</tr>
<tr>
<td>dependent upon the standard that living</td>
<td></td>
</tr>
<tr>
<td>people have: T or F</td>
<td></td>
</tr>
<tr>
<td>4-Which organism can alter the level of</td>
<td>Humans</td>
</tr>
<tr>
<td>resource consumption?</td>
<td></td>
</tr>
<tr>
<td>5-Can humans alter the number of offspring</td>
<td>Yes</td>
</tr>
<tr>
<td>that they produce?</td>
<td></td>
</tr>
<tr>
<td>6-If we want the world to sustain more people,</td>
<td></td>
</tr>
<tr>
<td>which type of diet should we use?</td>
<td></td>
</tr>
<tr>
<td>7-What two things did humans increased by</td>
<td></td>
</tr>
<tr>
<td>having better fertilization, improved farm</td>
<td></td>
</tr>
<tr>
<td>equipment, faster transportation between</td>
<td></td>
</tr>
<tr>
<td>growers and consumers, and better irrigation</td>
<td></td>
</tr>
<tr>
<td>methods?</td>
<td></td>
</tr>
<tr>
<td>8-Know what can increase, decrease, and affect</td>
<td></td>
</tr>
<tr>
<td>human carrying capacity.</td>
<td></td>
</tr>
<tr>
<td>9-Approximately, is 600 billion the highest</td>
<td></td>
</tr>
<tr>
<td>estimate of human carrying capacity with</td>
<td></td>
</tr>
<tr>
<td>current technology? T or F</td>
<td></td>
</tr>
<tr>
<td>10-What is carrying capacity and how is it</td>
<td></td>
</tr>
<tr>
<td>represented or abbreviated?</td>
<td></td>
</tr>
<tr>
<td>11-The term “ecological footprint” refers to?</td>
<td></td>
</tr>
<tr>
<td>12-What is exceeded carrying capacity?</td>
<td></td>
</tr>
<tr>
<td>13-Approximately, 10 billion is the current</td>
<td></td>
</tr>
<tr>
<td>human population. T or F</td>
<td></td>
</tr>
<tr>
<td>14-What could we reduce by recycling aluminum</td>
<td></td>
</tr>
<tr>
<td>cans and reusing plastic grocery bags?</td>
<td></td>
</tr>
<tr>
<td>15-Give examples of quick waste?</td>
<td></td>
</tr>
<tr>
<td>16-Define the term “standard of living”</td>
<td></td>
</tr>
<tr>
<td>18-Reducing the fossil fuel we use could</td>
<td></td>
</tr>
<tr>
<td>reduce our footprint on Earth? YES/NO</td>
<td></td>
</tr>
<tr>
<td>19-Which country has a very high standard of</td>
<td></td>
</tr>
<tr>
<td>living?</td>
<td></td>
</tr>
<tr>
<td>20-What would happen if everyone lived using</td>
<td></td>
</tr>
<tr>
<td>U.S. standards, and how would it affect our</td>
<td></td>
</tr>
<tr>
<td>human carrying capacity?</td>
<td></td>
</tr>
</tbody>
</table>
S1: The study guide was just for you to know what to focus on for the test. . .
S2: ‘Cause, because, these study guides they, umm, they tell you, like, well they tell you how... what to study on the chapter, and usually it all made sense. When I did the study guide, I’d understand. Like, for population growth, why women who have more education don’t have larger families. Like, doing the study guide, it helped me to click it, like, to connect together.

Teachers also helped students digest content to its essence toward right answers. In one AP Psychology class, the teacher made study guides to support students, reviewed the study guides verbally, and prepared a Powerpoint presentation with questions and answers for review before the final. Students in the AP Psychology class noted how these digestive aides, plus having time to review with or without the teacher, plus accompanying textbooks plus the Internet, made passing tests pretty easy:

R: Where did you go to get the terms that were on the study guide?
S1: Google... all the terms are usually in the online lectures or if not they are easily found in the textbook... umm like...
S2: I think that everything on the study guide was on the test, so if you studied the study guide then you did good on the test.

Teachers ranged in their use of study guides, While some teachers explicitly held review sessions using the study guides, one AP Environmental Science teacher explicitly did not review the guides with students; she also offered no credit for using them. Instead, she would gently guide students to get right answers by advising them where to look for them (“look at X animation” or “think about the Phosphorous cycle”), not by giving the answers directly. She worried at times about over-digesting material for students through study guides. Still, her students received an optional guide for each chapter quiz, the midterm, and the final.

At one point, however, this teacher felt that students were focused more on the study guide rather than reading the full online material. Consequently, she announced to students that she would withhold the study guides until she felt that students had “earned” them. Adults thus both supported students to find right answers more quickly and in some cases, refused to offer such help when it seemed excessive and harmful to learning.

When humans guided students to the right answers more quickly than the computer, even students suggested this much help was not actually “necessary,” though it was welcome. Students from another class noted that they had to study just “for one minute” with their teacher-made study guides, making the exams extremely easy. “Don’t tell her because she’ll make it harder,” one smiled.

Overall, the learning task of quickly getting right answers for Scout’s assessments prompted ongoing summer use of humans as well as computer and paper as digesters of content. To students, such help felt somewhat “necessary” in order to keep up successfully with the pace of
the class, but participants also acknowledged that in some ways this digestion for students overstepped students’ actual needs.

Humans as explainers of content

Researcher: Can you [students] see yourself taking this course from your home alone and being equally successful?
S1, S2, S3: No.
S3: Not at all.
S1: In psychology, you have to have a lot of questions to understand what we’re learning about.
S3: And I think if I just went along with the website I wouldn’t understand it because some of the questions and examples they use are irrelevant or are just confusing.

AP Psychology students

The UC Scout courses explained key concepts like population growth, stages of infant development, or “social status” directly to young people via online text sections (most common), videos, or animations. Students and teachers praised some of the computer’s explanations: as one student stated, “It tells you examples, like, real-life examples, so you can use that to understand.” For others, the Scout multimedia -- the pop-up characters, automated responses and animations -- were often engaging. As one TA said of the new Algebra II Scout course:

TA: I would be more interested in learning math with their lessons -- that they have like lots of videos, they have like... it’s more colorful. It just seems more interesting. It’s more aesthetically pleasing in my opinion.

But for many students, teachers, teachers’ assistants, and peers played an essential role in explaining content beyond either book or on-screen material, in part because the content presented online was often not fully comprehensible to them. As students in an AP Psychology class explained during a focus group:

Researcher: Many of you [students] are asking questions consistently. What are the questions about?
S1: Content. Like if I don’t understand something, I’ll just raise my hand and like the TA will come and whatever, and help me understand.
S2: I just think that we have difficulty understanding it because sometimes the examples that they give are weird. And the TA’s examples are easier to understand.

Students we surveyed stated repeatedly that teachers and teachers’ assistants played a fundamental role in supporting the students’ comprehension of content, in addition to answering occasional questions about course tasks (e.g., “I needed help knowing if I had to submit my answers on one page before going on to the next on my quiz today. A tutor helped me.”). Students frequently asked for 1-1 “help” on content from teachers and teachers’ assistants, whenever they didn’t “understand” the computer’s explanations. Typical content questions (answered 1-1) in the
AP Psychology course profiled later in this section were these: (See Appendix A for a full list of typical questions across the courses).

- I didn’t understand the difference between 3 concepts. [TA] explained all 3 and the differences.
- I didn’t understand one of the assignments of conditioning and [TA] helped me understand more than the assignment.
- Today, I didn’t get the concepts of daydreams and illusions. But for the illusions, a friend helped me and for daydreams, Ms. [TA] helped me.
- I didn’t understand this concept of classical conditioning and [TA] showed me a visual diagram to understand the concept.
- In the past 2 hours, I didn’t need any help, but most of the time I need the TAs help to understand a concept.
- I didn’t understand about sensations and perception but another student helped me learn it by giving me examples and I read it on my own in the book.
- I needed help understanding a lesson so I told [Student] if she can explain a certain word and then when she helped me I did the lesson with ease.
- I needed help on what type A is so [Student] explained it to me.

In some cases, students figured out their confusions with peers as well or used the internet to google definitions, without additional adult help, to develop their understanding of the content. But often, adults in the room supported students “on demand.”

Humans Explaining Content On Demand

The AP Psychology teacher’s assistants⁵ – as well as many others across the Scout classrooms – routinely supported students on demand as students worked on online material. Students in the course encountered online readings on “brain lateralization,” for example, and had to explain research findings in short answer form ("Based on what you have learned about brain functioning, explain these results"). Typically, as they worked on such required material, students asked TAs to elaborate on concepts in psychology. For example, a student or table of students would ask for assistance during their designated time to work on their online assignments, asking, “Can you help me get a better concept of this?” or “We still don’t get it. Can

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⁵ Both TAs had prior expertise in the field of psychology. One had just graduated from the University of California, San Diego with a bachelor’s degree in psychology, and the other was a current psychology major at UCSD. The actual teacher taught history and economics. The teacher emphasized the TAs' enthusiasm for the subject as the reason she supported them to support the class so actively:

Well, they were just really enthusiastic so I think anytime you ever try to teach anybody anything, if you’re enthusiastic about something that just transfers over to the students. So if you’re really passionate about a subject, and I could tell right away that they were passionate about psychology that I just wanted to let them run with it.
you give us another example?” During computer time, the TAs circled around assisting students with questions they had.

In an example from week 1, a student was stuck on Unit 1 lesson 4 (below), an assignment that asked him to form a hypothesis about the psychological phenomenon of his choice:

Design your own psychological experiment. Remember, the goal of an experiment is to show that one variable causes another variable. Make sure to:

(a) identify your hypothesis  
(b) state your independent and dependent variables  
(c) operationally define your variables  
(d) identify your experimental and control groups  
(e) explain what would happen during your experiment  
(f) postulate any extraneous variable that may influence your experiment

Though the student had read both assigned readings, he said he still was confused about how to make a hypothesis. The TA explained how to form a hypothesis in her own words and gave him an example of one, related to explaining how a heart might continue to beat shortly after death. He nodded his head and began typing his own hypothesis after.

As several students said in a Week 3 focus group, this sort of help felt necessary “to understand… the way [the computer] put it on there”:

Researcher: Many of you [students] are asking the TAs for help during your online section of class. What kinds of help are you asking for?  
S1: Like if we don’t understand something, like the way they put it on there [computer], we’ll just ask the TA and they’ll explain it in a different way to make us understand it better.  
Researcher: How important do you feel it is for there to be TAs in the room to help you with such questions?  
S1: I think it’s really important because…  
S2: Yea.  
S1: …we need that extra help to understand it. And they’ve majored in this, so I think, they got the concept down.  
S2: Like if it were just [Teacher] here, I don’t think everybody would understand it, like not everybody would get like, the individual help they needed. They actually know what they are talking about and they can help us better.  
Researcher: How often do you guys have questions?  
S1: All the time.  
S2: All the time.
The two TAs supported students in lengthy one-on-one interactions to explain core content, as in these two separate examples from field notes of classroom observations:

12:04pm TA helps student think of an experiment. She explains how there is a control group. They go back and forth talking while referencing the website and typing in her experiment. After 16 minutes, the student finishes her assignment and the TA walks off.

“It says homozygous for blue eyes and states brown eyes are dominant. Why don’t you write that down,” TA tells [Student] and she begins writing in her journal. “It’s recessive,” [Student] says.
The TA continues, “The big B is dominant and the little b is recessive so if any of the boxes have the big B, the child will have brown eyes.”
[Student] draws out the box with the small and big B traits. The TA and [Student] continue to use [Student]’s journal to write down the problem and answers. After 6 minutes of conversation and note taking, the TA asks [Student] to read the question from the computer. [Student] does and goes right back to her notes to look for a solution. [Student] is still unable to answer the question, so the TA continues to reference [Student]’s notes. They flip back and forth through pages of her journal for clues to answer the problem. The TA is patient with [Student] and allows her to figure out the problem herself, by not simply giving away the answer. Another 8 minutes go by before she gets the correct answer and the TA congratulates her as she walks to another student.

Students across the classes raised their hands often to ask TAs or teacher to explain content face-to-face, but, in some cases, adults in the room proactively supplemented Scout’s examples and explanations with verbal, whole class explanations. The AP Psychology class was a particular example of this more intensive content support. Indeed in this class, for much of the first 3 weeks of the 5-week class, a typical daily agenda looked like this:

7:30-9:00 am – TAs lecture or lead review sessions
9:00-12:00 pm – Students work on Scout curriculum via computer
12:00-12:30 pm – Lunch break
12:30-1:30 pm – TAs lecture or lead review sessions

Altogether, during this period, the two AP Psychology TAs spent 2.5 hours of the designated 5.5 hours of in-class time in whole-class or small group verbal instruction outside of the Scout curriculum, using a wide variety of forms of support to explain content. The remaining 3 hours were used for students to work solo on their assignments via their computers.

Humans explaining content (continued): leading explanatory and review sessions

In a typical review session, as noted above, the TAs would often split the class in two, with each TA leading a discussion. In these sessions, the students would bring their books and journals to look at previous content and take notes on what they may have missed. TAs would go through the
chapters of the book from the previous unit and answer student questions about concepts and content. The TAs would also attempt to spark student discussions in these sessions, such as this one, from Week 2 in AP Psychology:

    TA: What does it mean by motor development?
    Student A: Physical coordination.
    TA: Yes, when babies are young they go through stages of learning. Can anyone name some of the stages?
    TA: Good. What’s Longitudinal?
    Student A: Same children, different ages, long periods of time.
    Student B: I thought it was different children.
    TA: You’re thinking of Cross Sectional. Cross sectional are different children, different ages.

TAs also led class-wide review sessions customized to address student confusions, for example explaining controlled/uncontrolled stimulus and responses using a power point with pictures, charts, cartoons, and YouTube videos. On another day, they played an eye game, where the students competed to fill in the blanks of the eye’s functions on the white board and race back to their groups. The TAs told the researcher that they hoped these custom review sessions would support all types of learners, and they explained their instinct to support students this way based on their own university-level experience with the subject:

    TA 2: Psychology is collaborative and you get so much more out of it if you hear other people’s opinions. You can’t just be in front of a computer screen watching videos all the time, you need to go out there and apply it.

    TA 1: I think definitely with psychology you can’t do everything online. Psychology is more of like a discussion based class and that’s where we see our role coming in.

Humans explaining content (continued): frontloading content

TAs also offered lectures to preview next content, again with lessons using YouTube videos, games, handouts, demonstrations, and PowerPoint lessons, such as this one on Unit 2:
TAs also sometimes prompted student questions in large groups, for example after students read the online material below on “negative reinforcement.” Notably, the TA here relied on face-to-face presence to see “some confusion in a lot of your faces”:

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**Reinforcement**

Reinforcement strengthens a response and makes a behavior more likely to occur in the future. There are two types of reinforcement: positive reinforcement and negative reinforcement. **Positive reinforcers** increase the probability that a behavior will occur when they are applied. Food and social approval are common positive reinforcers. **Negative reinforcers** also increase the probability that a behavior will occur again. However, negative reinforcers increase the probability that a behavior will occur because they are removed. They do so by ending discomfort.

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TA: I’m seeing confusion in a lot of your faces. If you guys have questions we’re here. Are there any questions?
S: I still don’t get it.
TA: If your mom wants to get you to clean your room she may take away your tv. Does she want to increase or decrease your behavior?
Class: Increase.
TA: Yes, she is trying to increase your behavior of cleaning your room, so that makes it reinforcement instead of punishment. Punishment wants you to decrease your behavior. And is she giving him something or taking something away?
Class: Taking something away.
TA: Yes, so that makes this negative instead of positive. So which of the four is it?
Class: Negative reinforcement.
As students put it, these group discussions ("power points" and "the group thing") could help solidify their understanding, in part by talking through material in the TA’s "own words":

S1: No, we needed TAs to explain it, because when we read it by ourselves, we didn’t understand it sometimes.
S2: I liked it better when they would like, do power points and talk about it in their own words, ‘cause it’s easier to understand.
S3: Or like the review groups.
S2: Yeah.
S1: If she wouldn’t have helped me with that one question, I would’ve gotten a 9. The group thing helped.
S2: The what?
S1: The group thing. [She says while moving her finger around where they sat in the review session.]

As the AP Psychology teacher put it in Week 5 as the course ended, large group discussions like this helped "bring concepts to life":

The TAs were extremely helpful as far as bringing the concepts from the computer to life. So it can be really hard for specific types of learners, when you’re only reading and answering questions, and reading and answering questions, and so when they’re able to have discussions about the concepts with the TAs, the TAs are finding videos and all these other kinds of avenues for learning. I would totally agree they were essential.

Although the level of content support from the TAs in the AP Psychology class described above was the most intensive we witnessed across all the classrooms observed, other types of direct support on course material were provided in a number of forms by adults across classrooms. For the first weeks of the course, these TAs did a lot of something teachers across classrooms did to varying degrees: support students in person to improve their writing.

Humans providing writing assistance for explaining content

All the courses except for the Algebra I and Algebra II courses required the students to write and submit short answer or essay papers for grading. In the AP Psychology course, the students had to submit three short 5-paragraph, two-page papers at the end of weeks 2, 3, and 4. After many of the students received lower scores than expected on the first paper, a large number then asked for and received extensive feedback and criticism on rough drafts of their next essays, in part through face-to-face discussion. As this fieldnote excerpt reveals, the TAs discussed with students the content students were writing about, and read and proofread student drafts.

The TAs sit at a table putting together a final review for the last exam. Students sit next to them with questions about their last papers. A student calls a TA and she walks over to
explain women’s eating disorders and how different cultures view women’s weight differently, which is the prompt for the final paper. The TA says, “Certain cultures see a curvy women as ideal whereas in America, a thin woman is perceived as the more acceptable figure...” After she explains it for 8 minutes, she returns to her table. It has been 45 minutes and there has been at least one student at the table getting help with their essays the whole time. They (students) swap occasionally when they are ready to do it on their own and other students take their place.

In AP Environmental Science, students also had to submit short-answer (1 to 2 paragraph) written responses throughout the course. Teacher’s assistants in those classes might walk around the room reading over students’ shoulders as they typed their responses on the computer, or they would sit with students away from the computer to look at printed responses and provide suggestions on revision. Some teacher’s assistants also made themselves available to help students conceptualize their written responses. For example, one AP Environmental Science student reported:

S: Yeah, we were talking about the writing prompt today and, like, the question... [TA] sat down with us, like all three, ‘cause we were talking about it... ‘Cause I didn’t know how to answer the second question, which is like: “Is sexual orientation born with or taught?” So, like, we were trying to figure out, ‘cause I didn’t know from my personal experience, and then he, like, came to us and helped us talk it out and kinda figure out what the answer could be.

In providing additional explanations of content proactively, adults had to decide how much help to give. The TAs themselves in the urban San Diego setting decided there were some negative consequences to their own extensive help -- specifically, the building of student dependency on TAs for explanation. After three weeks of custom lessons and reviews, the TAs noticed that some students would learn the concepts of the AP Psychology class through the TAs, rather than use the site to teach themselves:

TA: The students are becoming so dependent on us. They’re supposed to be doing independent work theoretically, but they lean so much on us because they know we’re going to give them answers. They know we’re going to answer their questions and go over the key components of the lesson, so they just wait for us to explain everything so they’re not really like, having this be independent study anymore.

In response, the TAs changed tactics, reporting that they were now waiting for students to come to them for help. TAs also instituted a much longer silent work period to support students to work independently at their own pace. The TAs also now dedicated much of their time to proofreading and grading student papers that were due at the end of each week, noting:

We kinda don’t walk around as much, persistently asking ‘do you understand the assignments’ and things like that. Now they (students) have to come up to us because we are working on other things. They need to realize that if you need help,
you need to actively go and seek it rather than waiting for us to walk around so you can get help.

TAs also stopped prodding students to talk when they did gather students to review, noting that during a study group, “Before, I would call upon students who weren’t participating but in this last one, if they weren’t participating then I’d just let them be.”

A glaring drop off occurred in the number of student questions toward TAs during the new silent work time. One student explained that when they felt they were on their own, they indeed more fully read instructions of what to do rather than ask a TA who was conveniently there to explain it so they could skip the reading. (Similarly, as one student explained in another course, “I didn’t understand how the questions on Assignment 2 could be answered from the website, so I asked [the teacher]. She told me to read through the entire site, then attempt the questions. I did, and I was able to answer all the questions and finish the assignment.”) Some said they also now tended to ask their peers questions first so they would not bother the TAs, now busy with grading papers. But they also credited current understanding to the TAs’ early custom lessons, noting, “At the beginning they [TAs] would explain a little bit to us and then we’d be able to do it on our own” and “Yeah, it’s [lessons] building up together and it makes more sense.”

We also noted that when the urban class’s TAs started helping more on demand rather than proactively, the TAs spent much of their time giving extensive help to two of the 23 students, noting, “[Teacher] has told us to keep an eye out on certain students.” For many others at this point in the course, they explained, “As far as understanding the concepts and keeping up with the workload, they just need that extra little bit of assistance ...someone just there next to them explaining the assignment.”

We note, too, that while some called such extensive explanatory help “necessary,” however, students in the other AP Psychology course in the rural area, some 120 miles away, plowed through the material far more on their own. These students were also the ones who experienced the most consistent “digestion” of material by a teacher in preparation for tests; she made study guides and Powerpoints herself to help students review each section of the course. During the regular week, however, students in this class typically relied on external websites and peers for help on content, while TAs mainly sat in the back using the computer to grade. During tests they walked around to monitor the exam, sometimes answering basic questions on assessments, or collected scantrons for grading. In the class, adults offered little proactive full- group explanation of content: instead, they waited for student questions.

There were also about three students in the urban setting who did not need any assistance throughout the entire course. These students worked diligently in class and recorded many hours of work time from their homes. In a focus group they even expressed their dislike for TA custom lessons because it “took too much time” away from their computer time.

Thus, quiet days of students working alone in the urban site after the TAs stopped explaining so actively may suggest that students in the “high explanation” urban school didn’t need the help – at least to simply do vocabulary or basic comprehension quizzes. But their surveys (above and in Appendix A) also revealed many deeper concepts with which students were in fact struggling.
Students also may well have needed the help to move toward deeper applications of psychology in college. As students in the high explanation setting moved toward completion of the summer course, a TA noted that more solo completion of tasks did not necessarily mean deep understanding of psychology:

TA: I’ve seen some of their [online] work and they have just rewrote the question, or like, there are issues with the actual understanding, so I don’t know if they’re fully understanding the concepts.

As two students in the class argued, the final two weeks of independent work had focused on the pure completion of work rather than the deeper learning of psychology:

S1: I think I’m honestly just doing them [online assignments] to finish them, not really trying hard.
S2: Ever since we stopped doing those [TA custom lessons], I haven’t learned anything. I’m just rushing through lessons to finish them. And it just doesn’t go to my head.

Although grades should always be read with an understanding that they can be assigned differently from class to class and school to school, we noted that final grades in the high-explanation urban classroom were also actually not better than in the high-digestion rural classroom: in the urban classroom, only one student failed, but 13% got Cs, 43% Bs and 39% As, while in the rural classroom, 30% got Bs and 70% As.

In sum, we found that students in both AP Psychology classes could complete many of the course’s basic tasks toward passing grades just with on-demand human help or digestion tools like study guides, without as much proactive or full-class explanatory help as TAs in the urban site originally offered. But the overall goal of the urban TAs’ proffered explanation -- engagement with and application of key issues in psychology, as well as deeper comprehension or learning that would “go to my head” -- may have required some uniquely human support. That is, humans seemed necessary for going “further” or “deeper” with content. We discuss this in the next section.

Humans as extenders of content, toward application
Scout did not require discussion of concepts. Discussion, online or in person, was at instructors’ or course takers’ discretion. Yet some teachers extended and applied course material through regular discussion -- and in several cases, through extending and creating hands-on labs.

Discussion as a key feature of human extension of content

As noted earlier, Scout courses are designed for individuals to be able to access alone, with adult help on demand or TBD by instructor. Most Scout assessment came in the form of multiple-choice tests. Many “discussion” questions were actually short-answer questions asking students to repeat basic facts:

![Chapter 7: Carrying Capacity](image)

**Discussion Topic**

**Discussion Question(s):**

Is there an ultimate carrying capacity for humans on Earth?

Other discussion questions asked students to privately make an argument, which teachers could respond to online or in person or, just approve for adequacy:

![Chapter 2: The Cycling of Matter](image)

**Discussion Topic**

**Discussion Question(s):**

Many materials that are vital to life, such as fresh water and the nutrients nitrogen, carbon, and phosphorous, are part of complex geochemical cycles. The cycles often store these vital compounds for long periods of time in forms or locations that are inaccessible to living organisms. We have been able to disrupt these cycles so that the compounds we need move through them more quickly - is this a good idea? Discuss the water, nitrogen, carbon, and phosphorous cycles when answering.

The sociology course also included written reflection prompts that asked students to privately relate the material to their own lives, such as this. Again, any teacher response would be up to teacher:

What is race? What is ethnicity? What is your background and how does it affect your identity? Do you identify with your racial or ethnic background or do you feel different from that identity? Explain using examples from your personal life.
But one sociology teacher routinely supplemented this individualized curriculum with in person discussion designed to apply and debate the course’s concepts, offering a key example of a uniquely human role. Again, we studied such discussion only in in-person form.

The Honors sociology course used in summer 2013 promised to provide “an introduction to the major principles of Sociology”:

> It offers students a framework with which to address social and political issues, and teaches students to use sociological inquiry as a means of thinking critically about the social world and their place within it. Topics include sociological ideas such as interaction, social structures and institutions, and social change.

The course included units with topics like the following:

**UNIT 1: SOCIOLOGICAL PERSPECTIVES AND SOCIOLOGICAL RESEARCH**

*Unit 1 — Lesson 1: What is Sociology?*

**Reading:** no reading

**Key Terms**

- Sociology
- Debunking
- Empirical Approach, Empiricism
- Meritocracy
- Sociological Imagination
- Troubles
- Issues
- Social Structure
- Social Institutions
- Social Interaction
- Social Change
- Social Norms

Students in this course were required to complete brief journal entries called “discussions” to begin class and vocabulary definitions in a notebook that was collected at the end of the week and graded by one of the TAs. TAs noted that students received some motivational written feedback (“good job”), but credit was largely based on completion. The teacher also wrote some additional course prompts for essays and short 1-page journal topics (e.g., “explain Joker’s deviance” from Honors Sociology was a former UCCP course that was grandfathered in for summer 2013 only as part of the UC Scout portal. As of this fall 2013, we learned that UC Scout has decided to no longer offer this course.
the movie Batman to further explore “deviance” in sociology). Students also wrote longer responses to essay questions using Microsoft Word that were printed out and read by the teacher. Finally, some units required students to complete a group PowerPoint presentation, synthesizing information beyond that in the core readings. For example, in one activity, each group chose a religion to explore that they presented to the rest of the class, prompting debate over religious practices and politics.

The sociology course often seemed to use the computer little, relying more on paper notebooks, printed essays, group presentations and particularly, lengthy class discussions. Students used the computer essentially to read lessons or to watch video links related to the topic to be discussed, often at a collective pace (watching them on a projector). Sometimes the teacher assigned someone to read aloud; other times students silently read a section at the same time and raised their hands once they were done reading. Once most students were done, there was a class discussion on the topic, often drawing on personal experiences from students or the teacher. At other times, paired or small group discussion was followed by classroom discussion.

The teacher most heavily supplemented basic online material with full group discussion. He argued that these discussions were important for students’ grasp of material because “reading doesn’t give them [students] the concept.” Additionally, when asked if these discussions could take place through an online message board, the teacher added that discussions serve “a lot more purpose if it’s done within the context of the class...[in a] hybrid situation.” Students did not comment in focus groups on the potential of online versus face-to-face discussion; one student did say that hypothetically, if students taking the course didn’t have a face-to-face teacher, “they could just read what he said or what was said” by other students and still be able to learn from different perspectives. But in focus groups, students agreed that the face-to-face discussions were helpful to understand topics and moreover, to becoming open minded to the experiences of different people and cultures or, of multiple perspectives on fraught social issues (for example, racial profiling or gender roles). Students also shared that discussions helped them make personal connections to Sociology topics, aiding memory for assessments as well.

There were many instances in class where the teacher invited students to share a personal example, or added examples from his own life to flesh out the text first read on the screen. In the following example, students read a section from the online content (related to “considering gender roles”) and the teacher presented a short written assignment in relation to the text, pausing frequently to ask students to make connections to their lives.

One student read aloud and the others followed silently. [Teacher] facilitated the activity (short writing prompt) and made pauses to ask students questions. One of these questions asked students if they’d ever wondered how their life could be different. Some students said they imagined being rich, or being a girl instead of a boy.

[Teacher] shared that he wondered how his life would be different if he was a woman given that his interest aligned more with female gender roles. [Teacher] also shared that growing up he was like Harry Potter and he was often bullied.
In this example, the teacher asked students to verbalize a personal response related to the text presented on the computer before they wrote it in their notebooks. To conclude the discussion before proceeding to writing, the teacher also shared his personal response to the text, serving as a human agent that bridged computer content to a written assignment.

When asked if such personal connections could be made through an online blog or chat, the teacher, who had had experienced much online dialogue in his own graduate courses, said:

There's a difference between typing all you want, but it’s not the same as verbalizing. I mean you yourself when you’re about to write something, I don’t doubt you think this, you’re about to type what you want to say and you’re thinking, ‘It’s a lot I have to write down, how can I make it shorter?’ Have you not thought about that? Okay it’s easier said than just typing it out. And then some people lose their ideas when they are typing it out. It’s so much easier to just say it.

In online dialogue, he added,

. . . you lose that closeness, you lose the inflections that come with sarcasm, you know. Like [Student] uses sarcasm all the time! You lose so much of that if you don’t know how to write it effectively. You lose the touching jokes and the comments, and the spilling out of human emotion that can only be done with words verbalized in a repetitive sound of cadence, and I don’t know what else to say.”

Throughout small group or pair discussions or individual reading time, Mr. H also walked around to listen and engage in small group discussions reacting to online prompts or, to answer any questions students had, as in this example:

[Teacher] asked students to read the third paragraph entitled Domestic Colonialism. As students read [Teacher] walked around and as he got closer to [student] she asked him, “would it be what Cesar Chavez did?” [Teacher] responded, “How so? (inaudible)... he encouraged them to be respectful of their background.”

After about two minutes when most students began to raise their hand [Teacher] walked to the front of the class and initiated another discussion, saying, “The concept of domestic colonialism is very simple. The fact that we have this minority group and we are taking care of them, we tell them who they are... what they should do... now I’m going to call on [Student], because she has a very interesting connection to this history. Please tell the class what you told me.”

[Student] said, “Well I took it from Malcolm X and what he did for African Americans I took it to Cesar Chavez and what he did for the farm workers...”

As here, the teacher often talked quietly to small groups and then invited some students to share their thoughts or experiences with the rest of the class. In separate focus groups, students shared that this pattern made them speak publicly and also helped “everyone end up knowing everything”:
Student: [Teacher] he usually has us talk to our partner and then after talking to our partner for like two or three minutes he brings it up as a whole class discussion. He calls people like ‘what did you and your partner talk about?’ and so everyone ends up knowing everything.

Student: for me it’s usually he comes up and either listens to what I’m saying to my partner or reads what I’m writing and then when we are doing the classroom it’s like ’J I like what you wrote why don’t you tell it to the class or explain what you said to your partner to the class.. So I have to end up speaking in front of the class.

Student: If you don’t understand then you can talk to your partner and then that helps. If they don’t understand it or something then the whole class will talk about it and somebody will help you understand.

Throughout the course, the teacher led such dialogues illuminating sociology concepts from the screen with real world or personal examples. (This teacher used his TAs to grade, so that he was free to lead discussions as he did.) In addition to classroom discussion of large topics in Sociology, the teacher would also organize discussions to review vocabulary, a core expectation of upcoming assessments. He explained, “if they’re [students] gonna be reading something they need to know what the words mean, you know. They have to know what the vocabulary is so we always do vocabulary.” In focus groups, students agreed that these discussions were helpful to understand words that they otherwise might not understand. One student said, “. . .I could read a definition and still not understand the meaning of it (pause) so he is really good at showing examples.”

The teacher explained that review and discussion of vocabulary was largely about “application” toward comprehension:

T: They read the definition; they don’t know what it means. Like to actually APPLY it. That’s why we do the vocabulary, to apply it and say this is what this means, this is what that means.

In such discussions, students demonstrated that they indeed could at times repeat definitions, but not be able to explain the word. Discussion pushed toward the latter, and the teacher also prodded students to come up with their own definitions, debating “gender stratification” or “feminism” through gentle teacher questions like “think also about how many male nurses you’ve seen,” or, “so can you think of any ‘institution that forces gender’?” The teacher also encouraged students to seek definitions or additional information online, e.g. to google the concept of “multiple intelligences” in a discussion of the “cognitive elite.”

Was this adult help necessary or just optional? Honors Sociology students commented in separate focus groups that for the teacher, depth of understanding seemed to take precedence over pure rapid mastery:
Student: if you ask him questions about it he doesn’t mind he’s not gonna be like hurry up and finish the work. Like he cares about our understanding for it.

Student: . . . it’s a pretty comfortable atmosphere . . . what better example is there than a personal one to make it real?

Student: mm--m I would say yes because whenever I, like how he always asks for our opinion and that’s usually when we express what we think and then like he could relate what we think to what we’re supposed to understand and that’s also like that becomes a reference later on when we are taking a quiz or something like that.

Other students suggested that discussion was part of honing an “open mind”:

Student: Like well I think like the whole point of like these classes, like Sociology, Psychology, you need discussions because like the whole -- you should be open minded when you are learning about different cultures or like learning -- about a different society. Like if you go into like you stay in your mindset you’re not gonna be able to really grasp all of it because you’re gonna be like no I don’t care. But when you have discussions you see what other kids can say about it or other people’s experiences and it’s kinda like, oh. It allows you to not be so narrow minded towards a concept.

In sum, through discussion, students said they were able to apply concepts rather than simply define them correctly on assessments. These connections were based on the lived experiences of other humans present in the class. The teacher was the mediator of such discussions and built rapport by sharing his own experiences. The teacher believed the rapport and effect of human interaction might be jeopardized if these discussions took place exclusively through a computer, though we did not test such dialogue.

On our anonymous daily survey, some students noted that they did not per se “need” some of this extended human help to get the basics they’d be assessed on:

- I didn’t need help, though assistance was offered.
- [Needed help] understanding concepts on religion, but I figured it out

Also, in one focus group in the other honors sociology class, which had very little group discussion (and as discussed later, regulated student behavior heavily), some students indicated that they did not automatically like sharing “something personal.”

Researcher: ok and then after you write the writing prompts and everything you guys share right? Do you guys like sharing with the classroom?

S: No, I don’t like it because I think its something personal
R: do you feel the questions are too personal to ask?

S: no but like, I don’t like, well in my case I don’t like people hearing me talk or something. I don’t like it specially if its something about me I don’t like it.

In courses that didn’t allow discussion, some students called discussion disruptive. As one student divulged in an AP Psychology course where the teacher preferred individual work to discussion,

I kind of feel bad because we get really out of hand sometimes... When we have those discussions we get into arguments and [Teacher] is trying to control us.

While it remains unclear whether discussion toward application was essential for student comprehension, we know that students often noted that they did not fully understand the material until they discussed it and considered real-world applications of it. As one student in the discussion-oriented sociology class said,

Student: and like sometimes you can't relate to what the computer gives an example of. Sometimes it’s just like, “I don’t get that -- I don’t understand exactly what they are trying to put with that,” and then when he gets like the class to start discussing like their own personal experiences of it, it’s kind of like okay I can understand that because I’ve been in situations similar.

Again, extension of material through discussion didn’t lead to higher grades per se than a class with heavy, right-answer-oriented hand-holding: in the other Honors sociology class, which proceeded with very little discussion extending concepts and instead focused primarily on walking through course material and assessments as a simultaneous group, students did fine on final grades. 95% of the students received As and 5% received Cs, similar to how students did (grade-wise) in the discussion focused iteration of the sociology course.

Thus, students did not per se “need” discussion to repeat material toward success on multiple-choice assessments. They did, however, “need” discussion if engagement with material, deep understanding of concepts, and full application of material was part of the expected learning task.

Humans Extending for Application, continued: Supplementing with Hands-On Labs

A related version of humans extending the online content to “real world” application was AP Environmental Science teachers’ creation and execution of hands on labs to support online learning. The online version of AP Environmental Science was offered at two schools. Students were expected to complete online readings about concepts like water volume, tank capacity, liters, and SI units, and energy stored in kilowatt hours; assignments; study guides; and virtual labs, where students would click through questions after trying an online experiment. In this typical “simlab,” students were asked to consider a pump elevating water from a lower tank to an upper one, and to consider a graph of energy produced and consumed by various types of sources:
As another example, students had to finish this online lab project before the end of summer school in Environmental Science. Instructions for the online work were distributed on paper so that students could use them to study at home, where they may or may not have had access to the Internet.

The National Data Buoy Center is responsible for maintaining the data links with hundreds of ocean buoys worldwide. The data is available on line in real time. This project will ask you trace climatic data for a minimum of 14 days at a specific buoy.

Preliminary Research
- Go to the NDBC website at http://www.ndbc.noaa.gov/
- On the left column menu, click "About NDBC."
- Click on "Who We Are and What We Do At NDBC" to take the virtual tour to understand the significance of the buoy system and how it works to provide weather and climate data.
- Return to the home page.

Project
1) Using the map feature on the NDBC website select a buoy in a location you would like to investigate.

2) Next, choose 2 variables from the list below. If you want to use others, check with your instructor.

- wind speed  (meters/second)
- wave height  (meters)
- wave period  (seconds)
- atmospheric pressure  (millibars of Hg)
- air temperature  (degrees C)
- water temperature  (degrees C)

Note: some DART buoys (used for detecting tidal waves) may not have all data.

3) At the same time each day, collect data (metric) for each of the 2 variables for a minimum of 14 days.
   "Metric Units – This site will provide data in metric units. Once you have chosen a buoy, use the pull-down menu 'units of measure' and select 'metric'. You may use historical data as needed.

4) Complete the data chart on the next page.

5) Using the data collected, produce 3 graphs. You may use a computer or hand graph using the graph paper provided on the following pages.
   - Briefly discuss your findings with each graph.
   - Graph 1-variable 1 vs time
   - Graph 2-variable 2 vs time
   - Graph 3-variable 1 vs variable 2

6) Complete the conclusion questions following the graphs.
As stated earlier, all A-G courses, including Scout courses, require 20% lab time, but teachers of Scout are not regulated in lab work and can supplement lab work as they choose. Having taught the course for a number of years, one summer 2013 teacher created and led several hands-on laboratory experiments. (The other teacher used her labs as well.) The teacher, who had a medical background and taught AP science courses during the school year, believed it was important to include more hands-on laboratory work in order to prepare students for the challenges they would face in college science courses. In interviews, she spoke of the role of labs in “training” students in doing experiments:

I included more hands on labs. Nobody was expecting [them from] us and a lot of the labs . . . that are part of the curriculum are virtual labs, or paper labs, and I changed those for, you know, hands on labs. And we at least should have you know probably one or two labs per week.
The part which I play a major role [in], is in the labs, because I do need to train them. When they come to me, I assume that they have no previous lab experience, and for some that’s the case. Not for all of them but for some of them that’s the case. So I help to train them on an experiment on the side, and through repetition, through the course of the class we go over, and over and over again the different parts.

As she noted additionally, such “lab science” learning expected in the A-G sequence necessitated “hands on” learning. She considered this “an important component in a science class, not only in AP environmental science, but all the AP sciences classes”:

I think it’s important for students that are being prepared to go to college to be able to use instruments, you know science instruments, scientific instruments. I want them to be able to use a scale, to be able to use all the instruments of measurements we prescribe here, the cylinders. It’s a science class, it needs, it needs labs. You know like work labs, real labs, we go out and collect insects. . . . Also there is a component, you know, A-G [has] requirements for the lab science. And then in order for the class to fulfill that requirement, it needs to be hands on. So they need to have the experience, a lot of experience. And we take some kids to college without ever using... imagine going to your first lab class.

In one “Cookie Lab” the teacher created to help students understand issues of resource mining, topography, water cycle and soil, the class collected data as a group, and all students had to answer questions according to the data that was collected by the whole class. The teacher told the assembled group that to assure other “scientists” that their results were reliable, they needed various “attempts” to back up their results. The lab also asked students to use formulas from the online lessons. The teacher also engaged the group in a discussion of key scientific process terms:

She asked the class what their “constants” were. [Student] said “the formula.” [Teacher] wrote it next to “constant” on the board. She asked what else would stay constant in the experiment. A student asked if the habitat would stay the same. [Teacher] held up two bags of M&Ms; one plain, one peanut. She held them close together as if to compare size. She asked about the measurements that they would need to complete the lab. [Student] started to say something and then raised his voice and said, “oh it’s the formula.” [Teacher] added the number of species as another measurement. She told students they would take a sample of bio-diversity in the M&M bag for the lab. She asked them, “how do we know our study is reliable.” She told students that doing the experiment once would not be reliable and that’s why they were broken into groups to share data. The last section of the lab was the “expected result.” [Student] asked [Teacher] if it was the same as the hypothesis and [Teacher] said “not necessarily.”

The teacher also guided the students in using science notebooks as part of the scientific process, commenting after one student team in the room made a “connection” to their data. The exchange included a number of spontaneous face-to-face interactions over doing “science,” in which the teacher asked students to “unplug” to listen to her voice:
She added that scientists’ notebooks are “dynamic documents”, therefore, “use pen and don’t use whiteout; draw a line through the mistake and keep writing.” Some students went to the back to pick up their notebooks to make the correction. [Student], a student who usually sits in the first row walked to the back of the classroom and asked a question to [Teacher]. [Teacher] stood up and walked to the front of the classroom as she said “[Student asked] an interesting question.” When she reached the front she did raise her hands to her ears as if she was unplugging headphones and said “unplug.” Then she said, “[Student] asked how come we write in the notebook with a pen.” She reminded students that in this course they are “playing scientists in school” and that is how scientists work on their notebooks in real life. She shared the story of the discovery of the structure of DNA.

The labs’ extra in-person “teaching” was “more instruction” in the doing of science, as one student explained, “because you actually get to do it, and you get to interact with your peers and you could ask more questions cause labs are more complicated than the reading we do in class. So you get more instruction.” The teacher also supplemented the science writing aspect of the course, arguing that free response questions in tests served to “train them on how to write for science.” On her own, she gave students a list of “Organizational words for Writing prompts” (such as, define, interpret, criticize, describe, solve, relate, respond, and discuss) to help students understand the course’s writing prompts’ tasks.

When the teacher extended to “real science” in her hands-on lab work, of course, students commenting on the hands-on teacher-constructed labs sometimes remarked on their need for teacher explanations. “And like when we come to do the labs in here, in this classroom, she also teaches us how to do everything on the labs,” said one student.

At the same time, students also said they enjoyed the independence that was possible in online AP Environmental Science. Through weeks of observation, students worked largely independently and listened to music throughout the day, except when doing a laboratory experiment. In the other AP Environmental Science class, students noted that on “sim” (virtual) labs, students would often play around with the data on their computers alone until they could figure out the answers, or they would ask peers for help. Two students explained,

Others are the virtual labs in the computer, you mess around with the stats and see what happens. You read the little descriptions, and there are questions about the description you have to answer.

But if I’m doing a sim lab, I would have to talk to my peers cause they don’t wanna, they wanna make it a bit challenging for us in the sim labs.

As discussed later, students also tapped their peers for help much of the time rather than teacher. So extension and application of material was not per se “necessary” unless such extension and application was core to the learning desired: to the teachers profiled here, it often was.
Humans as providers of feedback and assessment

We found the summer Algebra courses a particularly salient example of another key human role: giving feedback to students on their thinking. These courses were our only remedial courses and, the newest versions of Scout we tested, with Algebra II hottest off the press. Of all of the courses, Algebra II offered the most updated automated supports, the most visually stimulating look, and the most multimedia content. Algebra I was slightly less developed. Yet even as these courses were the summer’s most technologically developed, the teacher in this classroom – who had helped her department raise the entire school’s math scores the year before -- was perhaps the most engaged in ongoing back-and-forth discussion on students’ learning process, engaging throughout every hour in 1-1 and small group help on fundamentals of mathematics as she walked around the room. Many of these forms of help seemed to hinge on in person support.

During the first week of instruction, there were 16 students enrolled in Algebra I and 8 students in Algebra II, in a room where each student had their own computer. By the end of the first semester (week 3), there were 9 Algebra I students and 5 Algebra II students. 6 Algebra I students and 5 Algebra II students continued, and all of the 10 students who took the semester two final passed the class.

Since initial enrollment of repeaters had proved initially challenging, what was originally envisioned as two separate courses with two teachers was collapsed into an Algebra I and II class in one room, all a situation particularly challenging for the teacher but an example of a potentially self-paced instructional situation. While having two levels in one classroom might make little difference if students were working largely independently, the teacher came to supplement Scout with heavy human assistance to students on mathematics, innovating a blend of computer and human instruction that seemed to favor individualized face-to-face interaction. She also spent several hours each day planning outside of class, and filling in what she believed to be the gaps of both the Algebra I and II programs, particularly by adding and replacing new types of assessments to check for student understanding. She explained her ongoing need to supplement:

T: Sometimes the way that the program presents the material is just not the way that I would present it. I can't choose what type of homework questions or assessment questions to put on there. Umm... I'm definitely a control freak, so this is like (laughs) I mean, you almost have to be, to be a teacher, so when it goes at... they go at their own pace-- and its nice because they can go as far as they want-- but... umm... I also can't control where they are, so if I have half my class that hasn't seen any of this stuff before, it's hard to do a lesson on it, because half of them are saying "Oh, I already know this," and half are saying, "What? Where am I?"

At the same time, the teacher herself noted that sometimes the computer could assist in just this way, by providing another explanation than the one she herself could offer:

T: I do like having another approach, like I have my way that I always do things, but it's nice to have the program if they are... if they didn't understand what I said, then
the computer can give them another approach, because, sometimes, it is a challenging thing to come up with different ways of explaining things to people.

The Algebra II Scout consisted of colorful lessons with some animated explanations and equations, about 3-4 “check-in” questions during each lesson, printable PDF group project assignments (not required), and a glossary of mathematical terms available in the “Resources” section of the site, plus homework assignments, unit tests, and final exams to end each “semester” of work. The teacher was immediately dissatisfied with what she perceived to be an unacceptably low number of homework practice questions, as she was self-consciously partial to teaching math through repeated practice. In response, she printed out her own homework assignments for Algebra II students to complete after each lesson. She also decided not to use the Scout-designed group projects, because she believed that it would be too time-consuming that summer for the students to work together on group projects she hadn’t had time to plan with, especially if students would be working at their own pace on the online lessons.

The Algebra I Scout consisted of video word-problems accompanied by text, several “warm-up” questions during each lesson, and a homework assignment consisting of 15 computer-generated multiple choice and fill-in-the-blank questions at the end of each lesson. During the first few weeks of summer school, the teacher asked Algebra I students to complete these computer-based homework assignments from Scout. However, by the end of the first semester (3 weeks into the course), the teacher decided that many of the problems were too complicated for teaching the Algebra I students (for example, questions contained too many variables). In response, the teacher decided to bypass Algebra I’s computer assignments as the primary comprehension verification method, and instead printed out her own homework assignments as she had done for Algebra II students. Once she had replaced the computer-generated homework assignments with her own, she explained that the printed homework assignments that she distributed were mandatory for students, while the computer problems were, in her own words, “optional” for the students who were working at an accelerated pace and wanted extra practice.

In addition to adding and replacing homework assignments, the teacher did not rely on the quizzes and tests provided by Scout to check comprehension. During the first semester, the teacher made her own unit tests for Algebra II, while using the Scout unit tests for Algebra I. By the second semester, the teacher created all of the unit tests as well as the final exams for both Algebra I and II.

The teacher’s innovations thus focused on supplementing Scout’s practice problems and assessments with her own. Scout explained the mathematics concepts “its” way; the teacher often explained the concept differently and in multiple ways in person, and guided students through ongoing practice and comprehension checks of her own design. The teacher additionally provided running assessment and feedback of particular kinds.

We often assume that computers can give immediate and individually tailored feedback, in ways busy humans cannot (Berding, 1997) (Clarke, 2003) (Hambleton, Foster, & Richardson, 1998). Over the course of the summer, as we observed both Algebra Scout courses in action, we came to ask particularly what running feedback these updated computer courses could offer to support students in math, vs. the humans in the room. We found humans – both teachers and, TAs -- were
necessary for some key forms of running feedback on student learning that Scout courses’ computers did not provide. Some of this feedback, though not all, additionally relied on face-to-face support—sometimes because of Scout’s design and sometimes because of basic computer capability.

Humans verifying student comprehension

In Algebra I, the homework assignments were initially completed and graded by the computer. However, it remained possible for students to click random answers until the computer gave them the correct one or prompted them to try again.

As of summer 2013, the Scout course did not have the capability to record the individual student scores, nor did it send student scores to the instructor via the Learning Management System. Therefore, students could progress through the unit lessons whether or not they got passing scores on assessments. In order to prevent students from doing so, the teacher required that students raise their hand after completing each lesson and show their computer-generated score to either a TA or herself. The teacher would then decide whether or not the student’s score was high enough to continue on to the next lesson.

In the first Algebra I quiz, some of the students who had high scores on homework assignments did poorly. The teacher became suspicious that some students in Algebra I were answering computer-generated verification questions and receiving artificially high scores that did not necessarily reflect actual mastery of the content.
Some students also scored low on teacher-assigned homework assignments and showed their low scores to TAs or the teacher, so the TAs and teacher could go over the problems or type of problems that the student missed. In both cases, the teacher decided to give all students supplemental tasks so that they could practice the lesson content until they could “prove” that they had a better understanding of the content. We came to call this “comprehension verification.” Essentially, the computer accepted students’ answers as sufficient for “moving on” far more readily than the teacher did.

In the e.g. below, the teacher asked an Algebra I student to show her in person that she understood a concept:

T: Ok, so prove it. Draw me a picture... (student draws in her notebook as teacher looks on) Good. Much better.

Students at times signaled to the teachers and TAs in the room that they didn’t understand even when they got correct answers. For example, in an interaction over an Algebra II teacher-made assignment on which he received a high score, one Algebra II student, “J,” looked over the corrected assignment and approached the teacher, admitting that he still did not actually understand the concept that the problem was meant to test. He began, “They (Scout) didn’t explain it well,” then added:

S: (to Teacher) I didn’t understand it.
T: You didn’t understand it?
S: (Shakes head.)
T: Do you want help? Let’s talk about it. How did you get these right if you didn’t understand?
S: Umm... I like...
T: Did you use substitution?
S: Well, I just looked at my pages of notes, and in the pages of notes I found how to do it.

We thus see that multiple humans (both instructors and students) were necessary to catch comprehension struggles, even when the student produced a right answer. In future iterations, Scout could be developed to not let students “move on” until they demonstrated comprehension on a more frequent multiple-choice assessment. But there remained certain comprehension struggles that humans seemed necessary for diagnosing.

Humans diagnosing student struggles

For example, the computer program only provided feedback after a student had clicked “submit” or “enter” on their final answer. In contrast, there were many instances in which the teacher and TAs were able to check student comprehension as students were completing their homework and assignments. In the following example, the teacher walked over to [Student] as she was working on a printed assignment in Algebra I, looked over [Student]’s shoulder, and pointed to her paper:
Teacher: (to S) What do you get when you get (???)... Are you sure?
S: Oh!
T: Good.

When students worked out problems on paper before submitting, as we see here, only humans, not the computer, could tell students they were “on the right track” before submitting an answer:

Teacher: I love this choice. I love this. Why are you erasing?
S: Because I got negative one.
T: What’s wrong with that?
S: (inaudible)
T: I’m loving what’s happening right now, because you (inaudible)...You can get negative one.
S: I did, but it’s wrong
T: (gasp) Oh, this is the key. (points to student paper) (inaudible) Then you’re done right? I just asked you what x is, you just did y. Plug it in to get x. You’re very much on the right track.

Humans could also talk students gently through errors at length, rather than coach right answers more rapidly as a computer would. In the example below, the teacher sat helping an Algebra II student go over a hand-graded assignment:

T: I think mostly they’re little mistakes. The problem is with order of operations you need to be careful.
S: I was careful.
T: We’re not—it’s ok. I see why you wrote that, but if you’re not a positive but negative, what kind of number are you?
S: Irrational
T: And?
S: Rational?
T: You’re either rational or irrational.
S: I didn’t think I was doing it wrong...
T: It’s okay. We’re learning.

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7 As students demonstrated in a focus group, students had diverse preferences on paper vs. online tests:

S1: I get really confused on the online [tests].
S2: Yeah me too ‘cause you can’t cross off.
S3: You’re just more comfortable on paper.
S4: I’m more comfortable online.
S5: Yeah.
S6: Me too.
Further, only humans were able to catch comprehension problems or “confusions” that appeared while students thought about mathematics. For example, humans had an ability to read non-verbal facial cues that suggested that students were confused or needed help, even when students weren’t seeking help. As one TA put it,

TA2: Like if they look like they have a confused face, I’ll be like, “Hey, is there something that you would like me to... you need help?” Sometimes they’ll still be like, “No, I’m good.” Then, like, they’ll eventually be like “Yeah, come help me out with this.”

Teachers and TAs also could conference with one another about student comprehension and analyze the root of student struggles with content, before students submitted “final” answers.

TA: (to Teacher) (inaudible) It’s not that she understands, so she needs to keep going. T: Ok. That’s fine. ...I think you’re right, I think she needs to (inaudible) Maybe she’s not reading the whole directions. TA: And she keeps getting confused about (inaudible) She gets that she counts down, but (inaudible)

TAs also noted that in person, “shy” or resigned students could be approached for help even if they didn’t proactively request it:

TA1: So, for Algebra I, I’ll notice sometimes that they just sit there, and you’ll be like “Do you need help?” and they’ll be like “yeah.” (laughs)
TA2: That’s true.
TA1: A lot are like really shy. Or maybe they weren’t... They’re probably not used to raising their hand in a math class and saying “I don’t get it.” They probably just sat through it and said “Oh well, I don’t get it.” So I, like, I find myself being like “Hey, do you need help?” and that’s when they’re like “Yes.” But a few of them raise their hand too.
(…)
Researcher: Do you do anything actively to like... how do you get people to be less shy or more comfortable with you guys?
TA2: Just approaching them.
TA1: Talk to them.

The students themselves were also aware of the fact that the teacher and TAs would approach them if they looked confused, even if the students did not verbally ask for help. Below, an Algebra I student discusses her experience of how TAs and teachers sometimes “knew” that students need help, even when they didn’t ask.

S Yeah, they would always go to you, and say like “Do you need any help, we’re always here,” and then they I guess they knew we needed help, because they would be like, “oh you know, let me see that problem” (laughs) and then they would go through it with you. So, yeah...
We might note here that having humans available for help perhaps prompted students to ask for help: left alone without human assistance, students might have plowed through without it. In a related example from another class, a researcher witnessed two girls asking multiple questions for the first time when sitting at a table with a TA, after three weeks of not asking any questions while sitting at their own desks working alone.

Further, there were some students in both Algebra I and II who could plow through each course largely alone and get enough right answers for assessments. But enough students’ actual comprehension struggles, combined with the ability to click through multiple choice final answers that perhaps masked those struggles, demonstrate that students often had more comprehension needs than perhaps would be diagnosed without active asking. We note too the importance of supporters “walking around” in person. While a remote teacher might be able to diagnose a comprehension problem after a student “showed her work” while answering a question, the online teacher might not be able to anticipate such problems.

Humans anticipating, recognizing, and reacting to common mistakes

Truly “intelligent” computers are programmed to adjust instruction based on student answers (e.g., a test that makes the questions harder the more you get right) and, to program multiple-choice options to anticipate common misunderstandings. The Algebra II site did some of the latter: the site had “wrong” multiple choice answers that stemmed from common mathematical errors, and would give directed hints based on which wrong answer the students chose.
Teachers too anticipated common misunderstandings based on the student work that they had graded, and then adjusted their instructional assistance based on how the students were performing:

T: (to Algebra I students during mini-lesson) DO NOT. Do not trust your instinct on this. Don’t say the answer, and don’t draw it down either. Everyone is going to draw a negative 12 minus 8, cause we’re getting a lot of little errors with pluses and minuses.

Or, humans could predict common misunderstandings based on prior teaching experience:

T: Right. How do I make my 3 into a 6? Sometimes people tell me to add, but you multiply, so just for the record you multiply.

Still, human assistance and explanations could be adjusted infinitely to push towards student understanding, where computers’ assistance was preprogrammed. Humans also trumped computers in another fundamental way here: when the students were making mistakes that the computer was not programmed to notice. We noticed repeatedly that the computer was unable to recognize common mathematics mistakes that stemmed from misunderstandings at a far “earlier” level of mathematics, such as positive and negative numbers, a concept typically introduced in later elementary or early middle school grades.

S: (to Teacher) Yeah, but a negative and negative are a positive.
Teacher: Yes, when you multiply, but when you add…
S: Oh!

Or, teachers could reference earlier basic division training:

T: (to Algebra I student) Back in the day we used to say “remainder 2,” but we don’t do that anymore now that you’re in high school.

In the following example, the teacher sat next to an Algebra I student and taught her a mnemonic device for remembering the difference between “greater than” and “less than,” a concept typically taught in 4th grade:

Teacher: (to Student) Remember the alligator?
S: (shakes her head)
T: There’s one fish on this side and three fish on this side. Which one would the alligator eat? (???) Do you agree with this statement?
S: (nods)
T: So one is less than three, so the alligator wants to eat more. So which way would the alligator eat?
S: (??)
T: Good, and what do we say?
S: Greater than.
T: Right and this one is?
S: Less than?

The teacher also spontaneously used her own body to explain the ‘x’ and ‘y’ axes on a graph, to an Algebra I student:

T: (puts her hand on her head) If someone is greater or equal to my head, where are they?
S: Above.
T: Yes. They are taller.

Humans, thus, could both anticipate and respond creatively to an endless stream of student misunderstandings in a way the computer could not.

Humans adjusting assessments based on student progress

Although many online providers have incorporated assessments that actively adjust to correspond to students’ real-time performance, the UC Scout assessments available for Algebra I and II do not as of yet have this “adaptive” capability. Moreover, students needed to enter their answers in a specific format in order to have the computer recognize and count the answer as correct. The teacher had more flexible discretion when it came to accepting multiple formats of the same answer. The version the computer wanted was not always the version the teacher preferred: for example, the teacher preferred students to write numbers as improper fractions (e.g., 142/8), whereas the computer required that all answers be entered in mixed number form (e.g., 17 6/8). Therefore, if a student entered an answer in the form of an improper fraction, the computer would mark the answer as incorrect, whereas when student work was graded by hand, students could receive credit for either answer format. This could be remedied if Scout were able to recognize multiple forms of the same answer as correct. TAs noted this issue in a focus group:

TA1 (to Researcher): Some of them (the computer problems), like, you have to fill it in a certain way, and even if you have like a correct number, but you don’t write it in the way they want it, it will mark it wrong.
TA2: And that’s not fair.
TA1: And, I don’t know, I just feel like a teacher would say “Oh... I see what you’re doing. I’ll give you the points because it’s still right, even though it’s maybe not this precise way I want it.”

In another form of flexible assessment, the teacher regularly gave students partial credit for being “on the right track,” and she also allowed them to re-take tests to improve their grade. The computer program did not include an option to give the sort of partial credit adults called for in the following examples:

T (To TA): Just let him know that these aren’t correct, but as long as his picture matches mine, and his foci (inaudible) then it’s okay. Maybe just tell him, “Can you just label these?” So, as long as he knows what co-vertices are and foci, and his (inaudible) are correct, then that’s fine.
Teacher (to students, regarding homework assignments): You can all re-do it and fix it if you want to get more points.

Each example required ongoing back and forth between adults and students, some of which could occur with a remote teacher and some less obviously so. For example, the humans helping in the Algebra classes often provided feedback to students who sought and received help during assessments:

An Algebra I student asks TA a question during the test.
S: (to TA, pointing to her test) What... What does this? So, are we supposed to (inaudible)
TA: Yeah... remember the problem in the morning? When we had this happen to us?
S: Mhmhm.
TA: So... (points to something on T’s paper).
S: So we (inaudible)
TAI: Mhmhm.

TA1 and TA2 help S during an Algebra I test.
TA1: (to S, points) It says to solve it by graph. What does it mean?
S: (silence)
TA1: Why did they ask you to solve by graphing?
S: Huh?
TA1: Think about it.
TA2: (to S) Just graph it and see what happens.

Additionally, the adults in the room often tried to encourage students to keep working, instead of turning in their test when they wanted to stop. Alone on a computer, students could just click “submit” and the computer would just accept it; or, a remote teacher would have to be waiting online to engage students. For example, when an Algebra II student, “NS,” attempted to turn in his test, both the TA and teacher convinced him to keep working on his test, even though class had finished:

TA: S, come on.
Teacher: (to S) If you feel good about it. Then you feel good about it.
TA: (to S) Come on, stay and get it right. (then something in Spanish)
S: (to TA) Yo no hablo español. (smiles)
T: (to S) (inaudible)
S: (smiles, takes his test back and sits down again to keep working)

In-person adults could also provide personal, supportive interactions of particular kinds. One student on many occasions expressed her lack of motivation, as in the following example when the TA asked her to re-do a problem from a homework assignment:

S: I’m not doin’ that one
TA: Why?
S: I don’t want to do that.
TA: What?
S: I don’t want to do that. It’s wasting time. It’s a waste of time.

In response to her struggles with motivation, the teacher and TAs regularly sat with her to help her stay on task for extended periods of time during class. Adults regularly offered this type of highly individualized encouragement to students during the summer session. In one TA’s words:

TA: I try to relate to them. I’ll tell them, like, “Yeah, man, I used to not like these problems,” or like “It used to be really hard for me too, but once you like (inaudible), it’s really easy.” I think once you seem more human and, like, friendly to them, I think that’s when they learn that “Oh you... You’re not that much older, and you’re not like a teacher. You’re kind of in the middle, so we can be like friends with you too.” You can form a bond like that.

The teacher and TAs often projected a sense of solidarity with students:

T: I don’t know about you guys, but my lines are never straight enough. (draws a line).

The computer encouraged too, with responses like “correct,” “incorrect,” “try again,” and even “Terrific!”, which some students agreed made them feel “like I understand it”:

Adults simply had a wider range of encouragement forms. Adults in person could include facial expressions and live applause with personalized praise:

[Algebra I student, to teacher]: I got it! Woot Woot!
T: Woot! Woot!
Following a re-take on a test that one student had failed, the teacher walked over to her and hand delivered an “A+ Awesome!” underlined in red pen. The teacher then sat down next to the student with a giant grin and wide eyes, saying, “Look what just happened! Holy cow!” The student grinned broadly as well.

With a similar level of energy, on the last day of class after the final tests were handed back to the students, the teacher stood before the class and announced:

T: Holy cow! I’m so excited! You guys worked so hard. Everyone give yourself a hand. (Everyone claps, many smile)

We note that this sort of support was not simply “human,” but offered by a particularly caring human. In fact, students found the level of human support during the Scout summer program to be greater than the human support that they received during the school year:

[Student] Well, my teacher [during the school year]... he would go through it, but he wouldn’t... he would just be, like, “Okay, if you get it you get, if you don’t then...” you know, but [Teacher]..., she actually goes through it, and if you don’t get it, she makes you understand. Like, she’ll go through it again with you separately. She works with you.

It must also be noted that the human-to-human interactions in the classroom were not exclusively congratulatory. As is to be expected in any high school classroom, the TAs and teacher were charged with the task of behavior management; the computers were not capable of regulating student behavior outside of requiring right answers or shaping sequential progress through the course. On multiple occasions, the teacher spoke one-on-one with not only the students, but students’ parents as well, when necessary to alert them to either motivation issues or shaky class performance.

The general consensus between the teacher and TAs was that students would not have been able to succeed in these courses without human intervention, and it was clear that they valued human feedback over feedback from the computer. When asked whether students would have performed in the class without the amount of human help provided over the course of the summer, one TA responded bluntly, “I don’t think they would have passed.”

While the teacher and TAs believed that human help was absolutely necessary for student success, the opinions of the students themselves were somewhat more divided. Some argued strongly that they couldn’t or wouldn’t do the course “alone”:

Researcher: Would you take a class like this at home without teachers?
S1 (Algebra II): No.
S2 (Algebra I): Mm-mm.
S3(Algebra I): No.
S4 (Algebra I): Well, if, um... if, like, they assigned, you know, this website to me, at home, to, like, study for a test or something, I would do it, but without a teacher? I don’t know... I don’t think I would (laughs).
In contrast, another Algebra II student rarely solicited or received human help, and according to him, the computer explanations were largely adequate, while the humans only pointed out “obvious things”:

Researcher: Do you ask the teacher often for help or the tutors?
S: Mmmm... no. Well, like, they just point out obvious things, like, I'll understand most of it from the computer, but they'll put, they'll point out like all the negative things and stuff like, “You messed up there.”
R: Yeah.
S: Yeah, but other than that, I know how to do it, ‘cause the computer tells it good. I think it’s... I think it’s easy.

As throughout the study, it was not always clear if the human help given to students was always wanted or necessary. The mere fact that human help was so readily available may have induced students to ask for help, even if they didn’t necessarily need it to answer assessments correctly. For example, on many occasions, Algebra students would seek help and not receive it, yet still figure it out on their own well enough to go “on to the next one”:

Researcher: A lot of times I’ve seen students raise their hand, but no one sees them, so they just put it down and go back to working at their computer. Has that ever happened to you guys?
R: (to S) And you, when that happened, why did you put your hand down?
S: ‘Cause she didn’t see me (laughs).
R: And what did you do?
S: I just went on to the next one.
R: Did you ask anyone else for help?
S: No.
R: Did you figure it out?
S: Yeah.

Moreover, human help was at times given when it may have not been necessary. For example, when the teacher offered unsolicited help to an Algebra I student to explain a common misunderstanding, he asked if he could rely on his notes, yet continued to receive human help anyway:

Teacher: Do you know how to tell the difference between greater than and less than?
S: Well... can I just look in my notes?
T: Well, have you ever heard of the alligator thing? (The teacher proceeded to teach him the mnemonic device to remember the difference between “<” and “>”).

On another occasion, the teacher asked if an Algebra I student wanted to work on her own or continue to receive her help. Though the student’s response was ambiguous, the teacher stayed to work with the student:
T: (to S) Ok, that’s gross right? This is not a pretty question. It’s not pretty. Maybe you can try another one, or I can sit there and try it with you, what do you think?
S: Umm...
T: What did you get for this one? Oh you didn’t do it?
S: No.
T: Oh should we try that before we move on? Is it because there’s multiple letters? Is that kind of scary?

For some, even lots of individual help on the Scout course did not mean success. Some students asked for a disproportionately large amount of adult help but still didn’t commit to remaining in the course. In a focus group interview with TAs, one TA explained that he felt that some students failed because they themselves didn’t put in the minimum level of effort:

TA: You could tell, like, right away that they just didn’t want to be there and didn’t want to try, so... I mean, there’s not much we could do if they themselves don’t want to be there. I mean, we would help them as much as we could when they were there but... certain students, even when I was helping them, sometimes even telling them the answer, they would not even be paying attention to me, so at that point, I mean, what can I do?

The comment raises particular questions about the use of Scout courses with students who may not “want to be there,” especially if such students are “alone” online. As the final section on adult help shows, adults’ heavy in-person regulation of student behavior could force completion of a course, but such “help” was neither possible remotely nor necessarily useful to students.

Humans as regulators of student behavior

Online learning is thought to allow students to “go at their own pace,” personalizing the learning experience in part by allowing individual students to speed up or slow down depending on their individual needs. One TA in Algebra noted that,

With the computer programs it gives an opportunity for students to go at their own pace, because I think that with this program, there is always some... like two or three students who were always like two lessons ahead or three lessons ahead. I think it’s nice for, like, the people who are more advanced to be able to pick up pace, and they could learn more things if they want... and also for students that may need more time, they can take more time on the lessons, on learning a specific lesson. So, I think it’s good in terms of that. It will give students a chance to go at their own pace.

But teachers working to support low-income youth in summer 2013 had varying opinions on the pacing that supported student learning and, on the ability for students to work successfully “alone.” Most asked students to stay at the same overall pace daily, urging students not to go further than one lesson ahead. During the 7 hours of a class, however (the equivalent of a week of the regular course), many teachers provided time for students to work through the day’s material at their own pace, while regulating the day’s overall pacing to some extent to ensure completion.
No teacher had young people moving fully at their own pace throughout the summer; no one could finish the course early and leave for the summer.

One teacher’s class was unusually highly regulated, almost outlawing the self-pacing possible with technology. Everyone read text aloud together, defined vocabulary simultaneously and even, watched videos simultaneously. At the same time, students in this class revealed on surveys that they often didn’t understand the computer’s material, making clear that students needed some support but potentially not support this heavy-handed.

Heavy human regulation of the learning experience came to seem somewhat “unnecessary” when computers could support some individualization of both learning and pace. For example, in each lesson, the teacher had students define vocabulary words on paper in groups before moving on collectively to the next assignment. The teacher would also announce simultaneous “book reading” using a supplemental text, and tell the students which page to turn to simultaneously:

    T: Lets go ahead and turn to page 271

Then she would call on a student randomly to start reading until the required passages were complete. The teacher did the same simultaneous reading with online passages. She would also keep tabs on group progress:

    T: Did everyone do the online reading?
    S: Yes (not so loud)
    T: I’m going to ask again and it better be a yes. Did you guys read the online reading?
    S: YES

The teacher also often required verbal sharing of written discussion questions and regulated all student use of time:

    T: Are you guys finished?
    S: Yes
    T: Do you have your presentation written down?
    S: Yes
    T: Close the videos on the computer and start practicing your presentation.

This level of regulation seemed on the one hand to thwart the potential of online courses to support individualized pacing or on-demand help or even individual growth. But the teacher explained that in part, she conducted the class this way to support every single student to make it through the summer:

    I was gonna try just to have them go through the Internet just by themselves just to see if they [could] do it. I was gonna try one day, and I thought, ‘no I better not break their norm.’ But I wanted to try it to see if it would work. What would they do. But one day what I did is I told them, ‘ok, you guys are gonna read only lesson 1 by yourselves.’ They were talking, they weren’t reading -- so I was like ‘no. its not gonna work.’ Cause my goal is to finish all
the reading, the book, to do their projects, and for them to practice whatever they’re reading and put it in practice.

No one in this class fell behind; they always had a least an hour of spare time at the end of every day; and everybody got to the end of the course at the same time.

Yet this assumption that students would lose focus if let loose to learn individually was proven somewhat wrong in other classrooms. Students in Algebra and AP Environmental Science, for example, were often allowed to work at their own pace until they needed assistance. In Algebra, some noted that if all students were allowed to work on their own they often talked less, rather than more:

S: Along with that, that it was less, like, distracting than a regular classroom, so that helped out.
Researcher: What kind of distractions do you find in a regular class?
S: Just people talking all the time, or, like, they’ll argue with teacher. (laughs)

Overall, students welcomed individualized pacing within limits, combined with “resources there to help” when needed:

S1: I think it’s better because you are by yourself and you get to like go at your own pace and you have all your resources there to help you.
S2: Yeah.
Researcher: Ok, so are you really able to get like, to go at your own pace and get ahead or something?
S2: Yeah.
Researcher: Are you allowed to get ahead as much as you want?
S1&S2: No.
S3: Yeah 1 or maximum 2 chapters.

Students in another focus group appreciated being allowed to go at their own pace, but also noted just how important on demand assistance was to them as well:

S1: I’ve noticed in that class is that… it’s very umm independent. Like they give you a set amount of work that has to be done by the end of the day, you have to finish by the end of the day. You have to manage your time—so that you are able to finish it in time. And it’s a very nice experience that you get to do that. A lot of the classes I’ve taken there’s a lot of hand-holding and like ummm schedules that you have to follow and adhere to while here there’s a little bit more responsibility on your part.

S2: Like he said you have to manage your time, but like they give you a lot of time.

S3: Also if you just need further reference. Just google something and whatever website that takes you to.
S4: So that you can analyze your own work you know, that’s important. And you can see what you think is missing or what you need to add. And if you’re just confused, Thank God! She’s right around the corner you can just go ask her. Or if the aides graded it you can ask an aide.

Students and teachers welcomed a mix of regulation with freedom, and of on-demand assistance with assistance proactively offered by teachers. Too much individualized pacing could be challenging: in response to a researcher’s question about “the biggest challenge about having the blended environment,” the Algebra teacher noted that individualized pacing made helping on common misunderstandings more difficult too:

Thinking about Intermediate Algebra, I think it was tricky to have them going at their own pace, because there are times when they are working on homework, and I’m realizing that everyone is missing a certain thing, that they’re not understanding how to do it. But it’s always kind of tricky to figure out when to pause them when they’re doing working on their own and bring them together, because I’ll be pausing some students before they’ve even see anything on the program, and others who are three lessons, you know, past. So, I think that was a tricky thing: Just having people in different stages of the program.

The mix of group pacing/freedom seemed necessary for supporting students who might not have the “study skills” to do the entire course alone at their own pace. One TA noted that “for skilled learners who already have study skills,” self-pacing could work fine, “but if you don’t come in with, you know, with those sets of skills, then you will fall behind, because you wouldn’t be able to catch up.” Another Algebra TA worried that students left too much on their own wouldn’t prepare for the rigors of college work:

So I think that, maybe, [it’d be useful to] incorporate some sort of study skills in the program. Like, sometimes with students, I’ll talk to them, and help them with their work, and they’ll have a question, and I’ll be like, “Why don't you look at your notes?” and it doesn’t seem like they have good notes to look at, because the computer doesn’t tell them to take notes. So [the program] should say, “You should write this down somewhere.”

In any case, no student was left truly “alone” in summer 2013: a final human aide students leaned on often in the classroom was peers. Especially in classes where adults offered help on demand or stayed largely hands-off, students often leaned on their peers for assistance before turning to teacher or TAs for help.

Human peers as supporters

Student surveys were full of examples of peer help, across all courses:

- Today, I asked my friend for an example to a key word I had to find, she didn’t know any examples, so we had to wait until we reviewed the key terms to find an example. (Honors Sociology)
When allowed to work together, students regularly collaborated with peers to complete work and leaned on peers for support before or after turning to adults. The following excerpts demonstrate students working together to complete assignments or prepare for tests, in AP Environmental Science:

Researcher: [how many of you] work with partners?
S1: All the time!
S2: They are usually more helpful than the teachers, or aides
S3: yeah I think everybody talks to their neighbor and asks their neighbor for help more than anything.
S4: Yup. And then when they don’t know the answer you go to the teacher.
S5: I walk across the classroom and ask this guy sometimes (points to another student)
S6: I enjoy walking across the classroom to discuss the topics that we do with other students. Always.

Student 1 and Student 2 worked on this simulation activity together at a shared screen:
S1: What is this called? (Pause) The reactor of vessel pressure. What sequence are you on? Three? (S2 nods head)
S1: Bring down the red scores bring them down... No the valves aren't open!
S2: This one?
S1: Yeah now stop. See you need to keep it level just don't let it down to the black line. Whenever it starts dropping low, there you go it froze
S2: ok that's not all I did
S1: That's why I put 'moderate the amount of water coming in and out reactor vessel.' You know how you were opening and covering the valve?
S2: ummhuh
S1: That's what you were doing. Moderating the volume. I guess you could put
S2: By what? Byragging. Moderating the volume in the reactor
S1: All the way down and then moderating the water that came in
S2: Ok, dude I won!
S1: What do you mean you won?
S2: It's not bursting. And it's like the same thing!
S1: Ohh yeah you just seal the valves
S2: It's not burning
S1: okay you just sealed these valves here that's what you did.

In observing peer interaction across the sites, we note the role of physical interaction -- students pointed together at shared screens, shared and flipped through paper study guides, walked across the classroom to discuss with their peers, and established peer rapport by making physical contact:

Student in the front row worked in a study group of six people. This group was particularly loud and constantly laughed. A student answered a question aloud while
hitting the other student on each syllable. The rest of the group laughed. (AP Environmental Science)

Students also split up work for group completion. Often, when peers around a student didn’t know the answer, a student would ask the teacher and then return to peers to share the answer with them. Peers also helped each other find required information online:

[S1], who usually sits in the front row, walked around to seat between [S2] and [S3] in the second row. They discussed the questions from the chapter 12-13 study guide (not on Moodle)... [S2] turned to his computer and went to Wikipedia to search for “coal mining.” They all turned to read [S2]’s computer. [S2] said, “I don’t really get oil recovery (pause) I think there’s an animation.” He logged in to the Moodle and clicked on the animation and watched it one time. Then [S2] asked, “What’s the difference between first stage and second stage?” [S3] responded, “More oil.”

Some of this peer help ostensibly could occur online, some seemingly could not. One student described how he read facial cues to consider who to ask for help:

S1: I don’t really use Google that much
Researcher: Where do you usually go to get answers?
S1: I just ask my friend, well I ask [Student], the guy next to me
Researcher: So you ask the people around you. Like do you have a technique for when to ask the teacher and when to ask the people around you?
S1: like when the people around you don’t know. Like I ask her and then I ask him and then I ask her, and if they don’t know I go ask the teacher.
S2: I look at the facial expressions and how they are reading the text then I see if they know it or not. If they don’t know I ask the teacher
S1: That is way too complicated for me.
S2: if they look like, like they know what they are doing then I ask them.

Overall in this classroom, students said they valued peer work. While students welcomed the independence that came with an online course, independence meant a somewhat self-directed schedule -- not being alone. Thus, completion even of much “individual” work in this online course was a social activity.

Still, for students at times, additional Internet explanations (external websites) could fully suffice as support on class tasks. In one AP Psychology class, students turned to websites or search engines to support understanding of a concept more than to peers or teacher. These students were particularly independent learners, who occasionally leaned on peers for evaluation or guidance, and the teacher just for some technical issue and grades.

Overall Findings about the In-Person Human Role in Blended Learning

Scout came fully preassembled: Each Scout course offered premade content, activities, and assessments in sequence. Even with the many additional “mini-lessons” innovated by the AP
Psych TAs and the hands-on labs created by AP Environmental Science teachers, Scout remained the baseline “teacher” in most classrooms. The course provided premade infrastructure that most teachers did not fundamentally overhaul. Students commented in focus groups that teachers were not “allowed” to reorganize the courses because “UC” had made them. In emails or personal conversations, several new teachers asked the research team and EAOP what they were “allowed” to change, supplement or delete.

The exceptions were the many discussions led by the Honors Sociology teacher and, the Algebra courses: as one researcher put it, the math teacher in this study “totally overhauled Scout.” While the teacher appreciated Scout’s explanations and potential for self-paced self-teaching, she found the courses’ treatment of key concepts too minimal; so, she created her own lessons and homework to supplement the computer. In interviews, she explained that she felt the best use of Scout was as a baseline to support some students to self teach while she supplemented and taught others; her role as human was to spontaneously target assistance to meet student need.

Indeed, all teachers spontaneously supplemented Scout with various forms of human assistance, outlining perhaps the most basic human role: targeting help creatively to meet student need. We saw the importance of human creative innovation in taking learning deeper through in-the-moment discussion, explanation, extension, application, and ongoing creative verification of student comprehension. **We thus found an overall necessary human role in Scout classes was the human as innovator of content and pedagogy, shifting teaching in response to students’ ongoing needs.**

Like a publicly available, updated multimedia textbook, Scout’s premade, UC-vetted explanation of fundamental concepts available to all students regardless of local expertise is an important equity resource for California. Yet we saw humans needing freedom to supplement those online explanations, to both clarify and deepen the learning experience for students.

Ironically, however, teachers need to be particularly good at their craft in order to use Scout this way. If a teacher deviates fundamentally from Scout in order to provide self-developed explanations that aren’t as well formed, Scout’s core benefit has been circumvented. Teachers and teaching assistants who supplemented Scout most productively were those highly educated about the subject area, affording extensions, real-world examples, and participatory discussions. Using Scout as a springboard for learning, rather than a fixed “course in a box,” requires educators or supporters who know their content, pedagogy and student population exceedingly well. So, we fear Scout’s benefits will be under tapped if Scout is utilized in a setting with less expert teachers.

Specific forms of human help were more or less “necessary” to student success. Local (and remote) humans who could troubleshoot any tech glitches were essential to the courses happening at all. The computer itself digested core needed material, and humans also helped students further digest course material through study guides and pointed mini-lessons on what students most needed to remember for upcoming tests. While such digesting may have taught students some important study skills, we question whether this use of human talent was particularly necessary – Scout was succinct enough. Further, while students valued human help in taking the shortest route to a right answer, and while the course task of content coverage plus the
summer school schedule dictated this speed, digested, speedy coverage is not the learning most celebrated in K12 today or within universities. While AP has prioritized rapid content coverage, the Common Core, Next Generation Science Standards, and other trends in education come down on the side of depth.

Even while digesting content for and with students, teachers in the courses questioned how rapidly students should blast through digested content. As the Algebra teacher noted, even if kids passed Scout Algebra, she was not fully sure they had “gotten” everything they would need to know because she had to cut out a lot – digest too much – to fit the summer pace. AP Psychology students feared they had passed quizzes after digesting information but were not fully retaining the information. The experience raised a core dilemma of speed versus depth in online learning. Participants throughout the pilot worried that the course material had been whizzing by a bit too quickly for students, even when they succeeded on assessments. At the same time, in equity terms, students whizzing through material “successfully” enough added real coursework to their transcripts and increased their knowledge base – in ways that would have been absent in summer 2013 without EAOP and Scout.

We found human help with explanation of content and tasks from the computer, often needed. Students often had a wide variety of content questions after reading and viewing course material online. Humans particularly helped by explaining material in new, multiple ways after the computer explained it “its way.” At the same time, some students were quite able to answer a number of their own questions and at times appreciated more on-demand help rather than pre-help assuming help was needed (e.g., group read-alouds). Other students appreciated overview verbal explanation from both TAs and teachers. The ideal, students suggested, was on-demand and at times proactive explanatory help, specifically from someone who actually knew the subject area. Participants noted, importantly, that some overly proactive explanations of content could create student “dependency.” We also saw no evidence that heavy-handed regulation of group activity was “necessary” to respond to student confusion, but we did see some human teachers working hard to keep students on task, suggesting the need for some blend of regulated and individualized pace.

We propose that more obviously “necessary” to a robust learning experience was human extension and application of content. Brain research suggests that “gluing” to lived experience helps all students learn; proponents of “relevant” teaching call such gluing essential for the success of low income and students of color in particular (Villegas & Lucas, 2001). In summer 2013, only about half the classes routinely glued Scout material to “real life” through discussion of “real world examples” of Scout content. But students often noted that such discussion assisted with both comprehension and retention. We do not know if this dialogue could have occurred similarly online, because we did not test this, but we do note that such dialogue toward application often required a relatively small group: these dialogues about politics, sexual norms, or race-class inequality took place with teacher and a group of 15-30, and many student insights occurred as teachers quietly talked to individuals or small groups.

Relatedly, in-person humans were by definition necessary for any extensions offered in hands-on instruction. While peers could support one another to get right answers, they could not introduce one another to the techniques of hands-on science labs. If hands-on science is to be a necessary
part of learning science, as the Next-Generation Science Standards attest, online instruction will require supplementation with hands.

We contend that humans were particularly necessary as providers of feedback on student learning, as witnessed in the Algebra courses particularly. Humans could offer targeted assistance to support student needs the computer could not diagnose. While the computer only explained content once to struggling students, the teacher or teaching assistant could explain the content multiple times and in various ways until the students understood. As one Algebra 1 student put it similarly in a focus group, “I guess they (humans) explain more, and then if you don’t understand it, they’ll explain it again, and the computer won’t.” Another Algebra taker suggested the same:

S: Yeah. I feel like I need the teacher... I guess.
R: And why do you need the teacher?
S: Because some things that she could probably explain better than the computer does... or she could go through more examples than the computer would, so that’s why.

As an Algebra TA put it, perhaps Scout would work best as one “aid” of many to engage students in a subject area:

I think the computer... as an aide, it definitely helps but I think you definitely need people around you to be able to call [on], just because there’s so many people out there who work differently and learn differently.

Some strugglers needed 1-1 help from humans on consequential misunderstandings. Sometimes, they needed the teacher to engage the entire class at once on a common misunderstanding. Some needed extended human explanation, even when Scout said it was OK to “move on.” Sometimes, teachers could sense this need through cues read best in person, before students “clicked submit.”

For students, local peers were also necessary (and pleasant) partners in a shared learning experience. Throughout the study, peers tapped each other for on-demand support. Yet even in cases where peers checked with one another before approaching adults, they often did approach adults at some point to verify or deepen comprehension.

In this study, thus, we found that skilled adults could monitor progress and tailor instruction in ways more nuanced than computers. To respond to misunderstandings, humans could keep trying new explanations for something students did not get the first, second, or third time, at a level of detail the computer did not provide. Humans could also switch explanatory tactics to engage struggling students, both as a group and as individuals. A teacher could also seize personal examples to make her points. This full range of flexibility in reaction to student needs may be uniquely human, and while such assistance could potentially occur online, some of this flexible “response” seemed to rely on face-to-face interpretation of need.

As we note elsewhere, “the ‘personalization’ efforts called for in schools today also require strengthening adult-youth relationships, typically assuming face-to-face contact and its attendant costs (Yonezawa, McClure, & Jones, 2012),” (Pollock & Amaechi, 2013). Humans acted as
caretakers of student well being and motivation throughout the classes; they taught grit and persistence. Some stayed late to help individual students; some smiled encouragingly at students at key moments; some used tough love tactics to insist that students read the full amount of material in the course. Some called parents to enlist the help of at-home adults to encourage or cajole students forward. Again, whether and how online Scout teachers can emotionally support students in these ways without ever meeting them “in person” will be a question for next research.

We note, however, that any additional support adults offered in these summer classes was still limited to the time when teachers weren’t behind screens themselves assessing online assignments. Some teachers spent their entire day (and lunch break) behind their own computers, grading. In this sense, human potential to support young people was, in some ways, underused in a number of classrooms: teachers had no time. Yet since a course or weighted grade point could make the difference between going to UC, state university, or community college, or going to college at all, teachers were caring for students’ well-being every moment of the summer, even when they graded online material in silence.

One could argue that determining the optimal use of human supports hinges on a deeper, final question about online courses and equity: what learning experiences should online courses afford?

Conclusions about Equity and the Human Role in Online Learning

For nearly 200 low-income students in summer 2013, UCSD’s EAOP program, with the use of UC SCOUT, offered a crucial infusion of credit-bearing courses in core and supplemental college-preparatory academic subjects.

This study investigated in depth the human role in this high-potential, equity-minded intervention by examining what program providers (EAOP) and educators (teachers and TAs) did in coordination with UC Scout curriculum when enacting this summer program on the ground. We saw adults taking time to check in additionally on student understanding, to ask students to expand their thinking to additional applications, or to explain material in additional innovative ways to students who remained confused. We saw grown-ups needed to diagnose students’ specific struggles and to explain material yet again (and sometimes again and again) in new ways.

In equity terms, we note that humans encouraged students to go deeper in their learning experience than what the computer accepted. Humans prodded students to ask questions regarding any given topic rather than simply provide right answers. Humans also chose at times to override the online material’s explanation of content to explain material in ways they found more compelling or, to afford students additional practice opportunities. Humans supplemented (sometimes heavily) the computer’s material with different or additional learning experiences they thought would deepen students’ learning. Humans also extended course material to help students apply core concepts to real-world examples. While Scout supplemented transcripts and provided solid content access, humans supplemented Scout’s baseline learning experience.
In-person humans did not seem so necessary to do other things important to equity, things that computers could do just fine: digest required material to its streamlined essence, offer baseline content, move students sequentially through content to completion, or efficiently grade multiple choice assessments toward credit for college eligibility.

Thus, we note that far from requiring handholding at all times, these low income students often did not “need” humans to supplement the computer: if equity in education opportunity was primarily about coverage of foundational material in sequence, and if the computer was explaining things well enough for students to get right answers or sufficiently informed short answers on a test, and if students could lean on the internet for right answers in preparation for those assessments, students often didn’t “need” help. But if students had trouble reading or understanding directions, or if the pre-made Scout explanation was unclear, or if students needed more practice, application or extension to fully “get it,” or if students needed goading to blast through tasks in the course’s summer timeline, they “needed” humans to step in. And if full equity in learning opportunity is about discussing and applying ideas more than basic comprehension and successful recall, students needed humans even more.

In “How Technology Wrecks the Middle Class,” economists David H. Autor and David Dorn argue that in employment overall today, humans are still needed to do work that is “uniquely human.” Such work includes “abstract” thinking, often characterizing high-paid labor (“tasks that require problem-solving, intuition, persuasion and creativity”), plus tasks (often characterizing manual labor) that “require situational adaptability, visual and language recognition, and in-person interaction.” Humans are needed for situational responses to complex situations -- even driving through a complexly crowded intersection, or cleaning a hotel room that is uniquely messy. In contrast, computers are better and faster at rote and routine thinking that can be automated (processing routine bills). So, while rote tasks “in the middle” of the economic spectrum are being automated, they argue (like the routine tasks core to clerical white-collar jobs), tasks at these more problem-solving ends of the spectrum cannot easily be (Autor & Dorn, 2013). Indeed, Autor and Dorn predict that “teachers, tutors and learning guides at all educational levels” will experience growing employment even in a computerizing economy, precisely because such work requires situational and creative behavior. But this will only occur if we consider ideal learning experiences to require “problem-solving, intuition, persuasion and creativity” as well. In summer 2013, computers could not explain material again referencing a local example, joke spontaneously with students to motivate them, or struggle through multiple explanations of material until students understood. Nor could computers talk to students about what they were learning. Whether remote humans could offer the same sort of support is a question for next study.

So if, when, and as we add pre-made computer-based courses to the course economy of California, it is possible that we might comfortably let computers aid with the more rote aspects of instruction -- things like the basic “transmission, organization and processing of [basic] information.” Far preferable to the textbooks of yore, computers can present basic information in sequence that students can access at their own micro-paces; pre-vetted, high-quality information and explanations would trump outdated information or, highly unskilled human teachers’ explanations. Computer content can also be updated rapidly as fields change; multimedia content can at times be explained in a more engaging way. Computers can grade multiple-choice tests.
Computers are, of course, also portals to internet exploration – and, to new interactive ways of learning alone and with others. But, we may need to lean on human aides to accomplish the “uniquely human” and flexible aspects of instruction: the situational reaction to students based on individualized need (sometimes diagnosed by computers); the “interpersonal interaction” and “problem-solving” that characterize any space where many students are struggling with ideas and concepts; and ongoing debate. Which of these human supports can occur remotely in which credit bearing, college prep learning experiences is a key question for next research.

Scout’s true game-changing use is as a full, preapproved, A-G credit-bearing “course in a box,” filling gaps in settings where courses or teachers experienced in particular subjects are simply not available. Yet for deep equity in education, the humans Scout requires to be associated with Scout courses need to be highly skilled at supplementing Scout with human-based learning experiences -- making connections to ideas not programmed in to the text, explaining material in ways not programmed in to the explanation, or discussing and debating concepts. Fully equipping learners may require the full engagement with material that only skilled humans can help provide.

We end with some recommendations for Scout particularly.

**Recommendations for Next Innovations with Scout**

We recommend that Scout developers and users might:

- **Invest in skilled teachers to support UC Scout.**

We recommend that in each case, implementers carefully choose a local teacher with experience in the subject, who is available to support students using the Scout curriculum. Ideally, Scout will be deployed by teachers who are expert in a subject area. (Scout also employs experienced teachers to support courses remotely.) Such teachers will be needed either to support basic comprehension skillfully or better, to support students in creative or deeper extension and application. Still, the economy of public education in California means that more often, low-income students may be the ones left alone on the tool or, reliant on a less experienced in-person instructor. A remote instructor expert in the subject may well be far better than a local one not expert, but we did not test the viability of remote help with Scout.

If local humans are less facile teachers or do not understand the material being covered, students can perhaps better learn from a UC-approved explanation available online. But for a thorough learning experience, students will need skilled humans excited to apply and extend the learning and, to respond to learning struggles as they occur.

We note that to get approval to teach Scout, a local, in-person teacher technically only needs a credential, not specialized expertise. This means on the one hand that a Scout course can be offered anywhere to all, but on the other hand, it means that supporting teachers may not have deep expertise. Aside from just one or two new teachers, EAOP purposefully chose teachers experienced in the subject area. The one teacher who heavily controlled the learning experience
was a first-time teacher of the course; when her computer crashed, she panicked. It was teachers deeply experienced in the course material who were able to innovate with Scout and, to support student learning when Scout explanations did not suffice. So, we recommend that Scout users seed skilled instructors as teachers, rather than imagining that the teacher’s expertise in an “online” course carries less relevance.

- **Support more teacher-driven flexibility and innovation in using Scout; invest in teachers teaching teachers about effective uses of UC Scout.**

We recommend that Scout support teachers to consider ways to use and supplement Scout flexibly, rather than consider it a fully-formed “course in a box” that has to be rolled out lockstep or wholesale without adaptation or human intervention. Some educators confessed that they felt they could not innovate with Scout at all because Scout was “already made.” But good teachers will need more flexibility. For example, our Algebra teacher expressed an interest in using Scout in specific ways to supplement her own curriculum. Like her, skilled teachers can perhaps choose to braid in Scout, using its best explanations and content examples, making choices about pacing and sequence, and using its online flexibility to engage students in learning in flexible chunks of time. Conversely, for a novice, a “course in a box” ready to use wholesale might be better than pure curricular innovation, but ongoing supplementation, explanation and feedback may be crucial. As with any curriculum, it will be up to each school to stand behind its offering of a course and, each principal to weigh in on whether teacher’s flexible offerings of Scout material are appropriate.

We recommend that Scout also encourage teachers and administrators to share ideas for using Scout as a flexible puzzle piece in school schedules – e.g., as credit-bearing curriculum supporting small groups of students who hope to move forward in a given area. We warn, however, that small-grouputilizations of Scout designed to circumvent a student ratio too small to pay a teacher may risk leaving students “alone” without the deeper learning a great teacher can help provide. Again, we suggest that teachers might leave students “alone” with Scout only for smaller periods, reaping the benefits of self-directed learning and then supplementing with human extension.

We note that teachers will also need flexibility to adapt Scout courses to fit with school-based sequences, particularly in areas like math – particularly as more school districts integrate traditional course-specific sequences. The elective AP Psychology course worked as a self-contained “course in a box” because no related courses existed at the schools. In contrast, the Algebra courses’ material had to be carved up and innovated with to fit in with the school’s math sequence.

Relatedly, teachers will need support to innovate pace as needed. Using the summer for supplemental learning frees up space during the calendar year for time on core college preparation subjects. But rushing through the summer also can risk forcing a focus on basic comprehension or “clicking through” courses to finish them on time, rather than extension or application.
We thus suggest overall that teachers might train teachers on tapping Scout as a resource. Scout might support a network of Scout-using teachers to share support needs and to innovate supports toward student success.

Teachers might also resist the temptation to digest, skim, and speed up further once computers condense required material. Instead, teachers can insist upon human dialogue about ideas, concepts and content, noting that clicking through to course completion is perhaps not “equity” in its fullest form. Education standards call increasingly for depth rather than speed; rushing through to completion may achieve crucial course credit, but deep equity in college preparation requires supporting students’ deep understanding of required material. Less often did courses in Summer 2013 support extended writing practice, or hone student skills in discussing ideas. As one researcher added, “getting a good grade in these courses would help get you to college, but in college,” students would need other transferable skills like making arguments, thinking critically and making connections.

So, Scout and humans using Scout can push for depth of engagement with Scout, offering detailed feedback to students and supporting the search for a rapid “right answer” with a press for detailed and deep understanding and application.

Dialogue with human teachers and peers – but guided by teachers -- was a particular way of honing skills and pressing toward deeper understanding. We did not test remote dialogue in this study, but others caution against assumptions that dialogues online are “the same” as face to face; next research should explore Scout dialogue online. And while peer to peer learning was seen often in this study, we did not yet see evidence that students could fully dialogue about foundational college prep content without any adult guidance.

- Continue to add to the material students can access on the screen, with an emphasis on adding opportunities to practice and engage ideas and, rich content that could drive discussion.

Many of the questions students had during the summer arose after students read or viewed explanations online. Scout of course can also continue to improve its own explanations of content; producers might vet its own explanations of content and tasks with focus groups of young people as well as teachers, in order to ensure that all text and multimedia presentations are clear to users. In the algebra courses specifically, the teacher worried about the need for more versions of online (and verbal) explanation and more opportunities to practice. Scout can consider adding more such opportunities. Scout can also continue to press for discussion opportunities, both online and in person; many students made clear that discussion was important to full comprehension. As a student put it of a teacher’s discussions, “When we are reading I’m just like oh I’m not getting this or like I have a hard time comprehending what I just read. And then when

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8 As MIT professor Sherry Turkle proposes, in online “discussion groups,” students “learn how to broadcast... Posting strong opinions isn’t a conversation (Turkle).” Again, the caution simply begs the need for next research.
he starts talking about it it’s like “Oh I get it! That makes sense. Why didn’t I get that from the reading?”

- **Support more student-driven learning, using the full potential of a computer.**

In this summer’s courses, students could “drive” their own learning individually to some extent, but that largely meant controlling their micro-pace on computer-made assignments. Students were not asked to explore new terrain using a computer or, to produce anything using a computer. Beyond using computers for remote dialogue (not tested here), Scout and users of Scout might also pursue the full potential of a computer -- to support collaborative learning, content production, and online investigation.

- **Overall, consider content/credit access and a deep learning experience simultaneously as equity concerns.**

Computer-based “best” explanations of content available to anyone, anywhere, are to some the equity holy grail of online learning. If one person has figured out how to explain the quadratic formula, some reason, why pay individuals to try explaining it over and over again? A good computer explanation would indeed trump a teacher’s misrepresentation, but achieving equity in learning is not just about affording access to single explanations covering basic ideas. Equity in learning is also about equal access to the chance to apply ideas, ask and consider questions, engage multiple conceptual frames, and even perhaps devise new ways of thinking about core concepts. Equity in learning also is not only about completing courses; it’s about truly understanding the foundational material in them.

So are human teachers needed to offer and innovate support as low-income students learn foundational school content online? Not in all cases, but potentially to engage students beyond surface comprehension. Much of the excitement about fully student-driven online self-teaching is actually about students using computers to learn subjects outside of schools’ demands (Ito et al 2013). How human teachers are and are not needed to support students through foundational, credit-bearing college prep material available online is a major equity question requiring ongoing analysis in our field.

However, we hear many reports of schools and districts laying off humans in budgetary hard times but spending money on technology, as if a computer as teacher is inherently preferable to paying a human. As we supplement human teaching with the important teaching computers can provide, especially in the flexible realms of summer and afterschool, we need to consider when and how to supplement computers with skilled humans to support deep learning for students on the path to college – even if humans cost money.

Supporting high-need students particularly has always been Scout’s main goal. So, in offering students online courses for equity, designers will have to navigate a classic core tension between balancing access to content and credit with ensuring the full possible quality of a learning experience. And, as designers of online coursework, design toward quality as well as accessible
learning experiences, so must users. Knowing that the task of clicking “right answers” to computer-based content is only one aspect of preparing for college, users seeking online learning experiences for equity might resist any focus on completion/coverage alone as evidence that students have been equipped for higher education success. We see offerings like Scout as a major potential resource for equity in content and course access, along with implementing organizations like EAOP. Use of Scout for both college access and deep learning will be in human hands.
Works Cited


Appendix A: Types of Content Questions Asked by Students Taking the Courses, As Shown on Student Surveys

(Surveys asked the following of students, who filled out the surveys to receive a Starbucks gift card. Students filled out surveys as often as the teacher reminded them to. The qualitative answers, #4, were most productive for research purposes.)

Dear Student,

Please fill out the following three questions. This survey should take you no more than 3 to 5 minutes.

1. How many times did you ask someone else in the class for help in the last two hours?
   - [ ] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5+

2. If you asked for help, who did you ask for help from (check all that apply)?
   - [ ] Teacher
   - [ ] Tutor
   - [ ] Another student

3. If you asked for help, what were the main issues you had to ask for help on?
   Rank in order of time spent overall with 1 being the most time spent and 5 being the least.
   - [ ] Technology use and/or glitches
   - [ ] Understanding of course content/concept
   - [ ] Understanding course assignments (e.g. directions)
   - [ ] Behavior of other students (e.g. X person is bothering me...)
   - [ ] Other: __________________________________________________________
     (please describe briefly above)

4. In the box below give one example of something that you needed help on. (e.g. I didn't understand the concept of osmosis; I needed help logging on; I didn't get the wet lab instructions in chapter 4, who helped you and whether or not the help was enough to get you to understand.)
The following are a sample of typical student answers to Question 4 above.

Algebra:
- Quadratic formula. The thing I needed help on the most was Quadratic formula and I had a great teacher to help me understand how to do Quadratic Formula.
- At first I didn’t understand the quadratic formula and I raised my hand and they explained it to me and I got the hang of it.
- I was having trouble with factoring, but [Teacher] helped me in mostly everything.
- I needed help on a problem and [Teacher] tried explaining it but I still didn’t understand it, but she used different example to help me.
- I was having problems understanding systems of inequalities, but my teacher explained it to me and then I got it.
- I didn’t understand the section 3 of lesson 21. It was kinda hard, but I figured it out myself.

Honors Sociology:
- I didn't understand satanism but i asked the teacher, and he recomended a couple of websites as resources.”
- "I didn't understand the concept of ethnomethodology. i asked a teacher.
- Sometimes I do not understand the writing prompts, but then [Teacher] clarifies it and then i am able to understand the prompt.
- I did not understand the concept of congress so i asked [Teacher]
- I didn’t understand one of the online lessons, but after we discussed it in class, I grasped the concept.
- Something i needed help with was understanding was how they considered racism and my teacher helped me with that.
- I needed help on understanding a vocabulary word so i asked my tutor and he gave me examples to help me understand it.
- In one of my assigments that we read i didn't understand a chart shownen in the book but then [Teacher] explained me that those where the rankings in which people where arranged by their classes from higher, middle, and lower classes.
- I don't understand hermaphroditism so i asked my friend for help
- I needed help on defining the word racialization and I asked my classmate for the definition.
• I didn’t understand the word global stratification today. [Teacher] then explain the word to the whole class and I finally comprehend it.

AP Environmental Science:

• I didn’t understand the concept of conservation today. [Teacher] explained it to me and then I got it
• I didn’t understand the concept of chlorofluorocarbons today. [Teacher] explained it to me and then I got it.
• I didn’t understand the concept of how hydroelectric power is beneficial to the environment. A student explained it to me and then I got it.

AP Psychology:

• I needed clarity on a key term so [Student] helped me with the word.
• I needed help with understanding unit 14 lesson 1, and [TA] & [TA] explained.
• For unit 8, I didn’t understand the concept of classical conditioning, so I asked [TA] to explain. I still didn’t understand it fully until [TA] and [TA] used a format to explain to me.
• (Peer) helped me understand the concept. (Peer)
• I didn’t understand aversive conditioning. [Student] explained it to me and I got it. It really helped.
• Today I needed help on my paper, so I asked the TA another student for help and examples.
• I first didn’t know what to right on bulimia but my friends helped me find some information on it.
• I wasn’t so sure if I had answered a question correctly on an activity because I didn’t really know what it meant. I figured it out myself.
• I didn’t need help today. I was able to understand what I was working on.
• The unit 8 was hard at first understanding some words but I kept reading it until I understood it myself.
• I didn’t really need help today, I just wrote a lot. When I got confused, I helped myself.
• I needed help on a more in depth definition and just searched it up on the computer.
• I needed help on understanding theories of emotions. I read online and took notes and thought of examples so I could understand it.
• I needed help with an assignment, but I figured it out myself.
• I didn’t really need any help today. The lessons were pretty easy & interesting.
• Today I was working on my notes, but I understood it clearly.
• Today I didn’t needed help so I really didn’t asked too help.
• I didn’t need help today, I just needed someone to talk to me so I won’t fall asleep. Today was pretty easy.
• I needed help on an assignment, but I simply figured it out myself.