REAP CHANGE CONSULTANTS

REAP Change Consultants
2872 Nicada Drive
Los Angeles, CA 90077-2024
http://www.reapchange.com
E-mail: consultant@reapchange.com
Telephone: (310) 384-9717

Report

East Los Angeles College
ES 221 Focus Groups

Stephen C. Maack
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Overview

1.1. This evaluation report has been prepared by REAP Change Consultants for the East Los Angeles College (ELAC) ATE grant 1801188 "Filling Skills Gap Through the Geospatial Engineering and Technology Program." The grant and its evaluation are funded by the National Science Foundation (NSF). As part of the grant evaluation Dr. Stephen C. Maack, Owner of REAP Change Consultants, with the assistance of Ms. Arlene Hopkins, an evaluator and architect, conducted focus groups at East Los Angeles College with students currently enrolled in Engineering Support (ES) 221, Land Surveying II.

1.2. ES 221 is the second course in a two-course sequence, with a pre-requisite being ES 121, Land Surveying I, or Civil Engineering 121. This is an advanced course in plane surveying. Topics include topographic survey, earthmoving quantity take-off, horizontal and vertical curves, construction staking, real property survey using electronic data measurement (EDM), application of global positioning system (GPS) and geographic information systems (GIS), and green surveys. Field work is performed.[1] Passing ES 121 and ES 221 makes a student eligible to apply for a Certificate in Land Surveying 1. The course is also transferable to any campus of either the California State University and the University of California systems for those students seeking a baccalaureate degree in Civil Engineering or certain other Engineering fields.

1.3. Two focus groups of approximately one hour each were held in person on campus on March 6, 2020. Each focus group had seven students. The students were not asked to provide self-identification of their demographic characteristics. Based on facilitator observation, the focus groups included 13 males and one female. Most of the participants appeared to be or sounded like they were of Latinx origin. Ages varied and included middle-aged people judging solely by appearance and comments made about experience. A few of the participants indicated during the discussions that they were married or had families to support.

1.4. The focus group questions are included in Appendix A. Participants were given copies of the questions to reference during the discussions.

1.5. Stephen Maack facilitated most of the discussion with Arlene Hopkins asking supplemental or clarifying questions. Both focus groups were recorded with signed permission on a cell phone and an Olympus digital voice recorder. The results summarized below are based both on notes taken by both facilitators at the time and on listening to the recordings. There were no serious problems that arose during the discussions. Questioning and answers stopped during minor interruptions by students wanting to use the room for a study session and reminders to end.

[1] East Los Angeles College is one of the nine campuses in the Los Angeles Community College District (LACCD). Three days before the focus groups LACCD Chancellor Francisco C. Rodriguez announced that none of the college campuses were closed due to the COVID-19 pandemic. However, within about a week after the focus groups Chancellor Rodriguez ordered all colleges to cancel classes on March 16 and 17 to allow faculty training to move as any classes as possible online beginning March 18. As of this report date ES 221 is being held online with Dr. Gallegos teaching land surveying theory but unable to offer any field work. The ELAC 2019-2020 catalog lists the course as having 2 hours of lecture and three hours of laboratory work which would normally include field work that the focus group and other students in this class are no longer able to do.

Findings

Interest in Land Surveying

Focus Group Question 1: "What interests you about land surveying? Why are you taking Engineering Support (ES) 221 this term, here?

2.1. The primary reasons that students were interested in land surveying included the following:

- Provides desirable working conditions (e.g., outdoors, not strenuous, good hours, benefits)
    - Mention of good hourly pay ($25 at entry to $70 for a crew manager with experience)
- Prepares one for the first step of a land surveyor career ladder (e.g., taking FS exam, becoming licensed)
- Provides land surveying training and knowledge that is a good (but optional) background for a different professional career (e.g., half of the students intended becoming civil engineers, two to manage construction);
    - Included wanting not to make mistakes in other work (e.g., story from a construction worker about lack of communication between an architect and an engineer that led to a foundation being laid in the wrong location due to lack of a land survey).

2.2. Additional key points expressed by one or two people each had to do with working while learning and advancing one's career and personal interest in working for specific employers (e.g., the City of Los Angeles, Los Angeles Department of Water and Power, CalTrans).

2.3. Several individuals wanted to be in charge, become a boss, or a "professional" like a civil engineer. One or two wanted to run their own businesses, notably in construction.

Taking More Land Surveying Courses at ELAC

Focus Group Question 2: What might either keep you from pursuing more courses or encourage you to take more courses in land surveying at ELAC>

3.1. Number of courses. In both focus groups the majority of students thought that there were only two courses available (ES 121 and ES 221). When students or the facilitator brought up other courses listed in the catalog (ES 224 and ES 225) other focus group participants would comment that those would be posted on the schedule then cancelled when not enough students signed up for them.

3.2. Limited course topics. Available ELAC courses only prepare students for the lowest rung on the land survey career ladder. A focus group participant compared ELAC land survey course offerings unfavorably with those offered at Rancho Santiago College, including GPS, Photgrammetry, geospatial software (Surveyor), drone use in surveying.

3.3. Frequency/scheduling of existing course offerings. Not all courses are offered every semester. When ES 224 or 225 get cancelled a student has to wait three or four semesters before it might appear as a course offering again. Students recommended that each course be offered at least once a year.

3.4. Ancillary courses. A few students noted the lack of non-land survey courses at ELAC that teach skills useful to land surveyors. These include computer aided design (CAD) with a focus on surveying, cartography (how to read and make a map), and courses in other fields that might use land surveyors (e.g., geology, hydrology, agriculture). Some students talked about the possibility of taking such courses elsewhere but noted that only the Los Angeles Community College District (LACCD) had a common online source for finding available courses at another LACCD college. Otherwise one had to spend a long time just finding an appropriate and available course (e.g., a GIS course at Rio Hondo College) in fragmented, confusing, and uncoordinated enrollment and registration systems.

3.5. Days and Times that courses are scheduled. The issues involved in attending class on a specific day or time varied by individual but there were several themes. All of the students in both focus groups worked for pay while attending ELAC. About half worked full-time (40 hours a week or more). Some had families to support and others were supporting themselves while attending college. One or two were attending classes at California State University, Los Angeles (CSULA) while also attending ELAC. There was agreement that holding ES 221 as a long class on Friday was tiring but no agreement on a good alternative way to offer the class. One student could flex his hours so could come on Fridays while another who had to work two or three days a week preferred working on Fridays and Saturdays so had to give up work to attend class on Friday. Students attending CSULA had additional problems juggling several class times and days of the week. Some students suggested evening classes, others weekend classes. There was however a majority opinion that students preferred face-to-face courses to online courses. One student pointed out that he was the first in his family to attend college and needed to have a professor or other students around to ask questions or get help when he had questions or needed assistance.

3.6. Cohort Strategy Might Not Work. One focus group discussed the possibility of having a cohort strategy in which a group of students would agree to take courses together. The students didn't think that this was feasible because of the course scheduling difficulties and lack of consensus on objectives.[2]

Educational and Career Plans

Focus Group Question 3: What are your educational and career plans? How does land surveying fit in with them?

4.1. A key purpose of the NSF ATE grant is to increase the number of professional land surveyors (especially Latinx and women). However, of the 14 students drawn from the Land Surveying 221 class, half (including the one woman) had other career and educational goals than becoming a professional land surveyor. For these students the second land surveying course is a supplement to their primary educational and career focus. The focus group responses are summarized in the table below.[3]

[2] Dr. Gallegos told Dr. Maack before the focus groups that he thought that this bunch of students was "almost a cohort." However, in response to question

[3] Thanks to Arlene Hopkins for the idea of summarizing the responses in a table form.

Educational Plans	Career Plans	Land Surveying Studies	Notes
Land Survey Technician (6)	Become a Professional Land Surveyor (6)	The beginning of every project. Essential foundation skills.	Students tended to want to complete their ELAC studies quickly so that they could obtain land surveyor technician or "Land Survey in Training" jobs and certification
Civil Engineer degree	Become a licensed Civil Engineer	Useful skill. The beginning of every project is land surveying.	One student said he had heard from a working professional Civil Engineer that "the best Civil Engineers are Land Surveyors."
Other degree	Other profession	Useful training	

4.2. One ambitious student wanted to become triple licensed in Land Surveying, Civil Engineering and Appraising. His career goal was to own and run his own construction firm. He was already working in construction, as several other men were doing or had done. Another student had been an engineer in another country, found that his degree and credentials were not honored in the United States, and felt that land surveying would be a way to get a job and enter a professional role that was at least engineering related.

Value of Community College Certificates and Degrees

Focus Group Question 4. In general, what value do you place on community college certificates or degrees, or are you just attending community college in order to obtain course credits to transfer later toward a four-year university or college degree or certificate?

5.1. Those wanting to become Civil Engineers generally were attending community college in order to accumulate enough credits to transfer (typically to CSULA or California State Polytechnic University Pomona) and obtain a baccalaureate degree. However, some were also interested in earning a community college certificate.

5.2. In both focus groups this question led to a discussion of the difference between advice from the general ELAC counselors and that from Engineering faculty about course taking strategies. Several students commented about how the counselors had advised them to take transferable general education courses, including some very unrelated to land surveying, such as Theater. One student said that he had accumulated over 150 community college units, got discouraged, left without a degree and was returning to learn a skill and obtain a certificate that would enable him to get a better paying job to support his growing family. Other students interested in transferring said that Engineering faculty advised them to take Engineering courses and only a few general education courses so that when they transfered they would be able to take junior level

rather than freshmen level courses in their Engineering major. They would then be able to finish up their general education at the four year institution. One student was advising others that at ELAC they should concentrate on courses in the "golden four" – English, mathematics, communication, and Engineering (which would meet general education requirements in science). Some students recommended having a counselor just for engineering who would understand this although other students said that they depended on the faculty as their academic advisors.[4]

5.3. In both focus groups students valued certificates, including the Land Surveying Technician Skills Certificate I, because it provided them with tangible evidence of skills that would help them obtain jobs as Land Surveying Technicians. While the students generally knew that passing ES 121 and ES 221 qualified them for the Land Surveying Technician Skills Certificate I, at least one student did not realize that one had to specifically apply in order to be awarded the actual Skills Certificate. Students pointed out the link between obtaining a Skills Certificate leading to obtaining an internship or job the experience needed to take the Professional Surveyors test and obtain that license.

Focus Group Question 4.a. How might the availability of an ELAC Associate Degree in land surveying change your interest in land surveying, if at all? What would you consider if deciding whether you would actually seek to ean an AS degree in Land Surveying?

5.5. Most students were interested in the possibility of having an Associate Degree in Land Surveying available at ELAC and many indicated that they would seek it if offered. However, some pointed out that there would need to be more Land Surveying courses offered, it would depend on when the courses were offered, what the requirements were, etc.

Focus Group Question 4.b. What can you tell me about other land surveying degrees or certificates available at other community colleges or universities?

5.6. At least one student in each focus group knew about and described land surveying degrees or certificates available at other community colleges (College of the Canyons, Rancho Santiago Community College District/Santiago Canyon College) or universities (Cal Poly Pomona, California Baptist University). The students were impressed by the variety of courses offered at College of the Canyons and Santiago Canyon College (referred to as "Rancho Santiago"). Some of the courses that they mentioned, such as one about drones, seemed to impress or intrigue other focus group members. One student mentioned that he had been told that to be employed at CalTrans, College of the Canyons was the preferred community college at which to obtain a land surveying degree.

Focus Group Question 4.c. Why have you pursued land surveying here rather than at other nearby community colleges with Land Surveying programs, such as College of the Canyons or Santiago

[4] The problem of inappropriate counseling for engineering and other STEM students is a known one. It was handled in an earlier NSF grant, the ASSIST grant obtained by Dr. Armando Rivera-Figueroa, by hiring a full-time Counselor specifically for STEM students, who also worked at educating other general Counselors about how to counsel STEM students appropriately. The ASSIST grant ended in 2015 and it is not known if the STEM specific counselor was continued on staff when the grant funding ended.

Canyon College?

5.7. Even after learning about more robust land surveying programs available at the other community colleges, focus group participants agreed that attending those campuses was not feasible for them logistically and in terms of commuting time. For example, one student pointed out that if he went to College of the Canyons it would take him two hours to get back home at 5 p.m. Attending classes there would interfere with work schedules or attending other classes here at ELAC or at CSULA. For these students attending land surveying courses at ELAC had a distinct geographic location advantage.

5.8. One or two students who had taken classes at other campuses, especially at four-year universities, favored the pedagogical approaches at ELAC. They clarified that they learned better from ELAC professors than from four-year university professors who expressed the attitude that this is the teaching style that I use, adjust to it, and if you can't learn that way, good luck to you. If this student was able to adjust to a specific professor's teaching style, that was okay, but he preferred a teaching/learning style that was more prevalent at ELAC.

5.9. In the second focus group both students seeking Civil Engineering degrees and those seeking to become survey technicians and eventually qualified land surveyors expressed an interest in having more internships available to ELAC students (e.g. with LADWP, CalTrans, or the City of L.A. rather than private companies). Students pointed out the value of internships, preferably paid but also unpaid, for obtaining jobs later. Students shared the information that one of the female ELAC land surveying students had obtained an internship that had been brought to their attention by a female professional land surveyor speaker earlier in the academic year. A male student said that he had been interested but noted that the speaker had indicated that she was especially interested in female applicants. Students discussed the difficulty of obtaining internships because of the serious competition for them.

Knowledge of Steps to Becoming a Licensed Land Surveyor

Focus Group Question 5. Besides learning about land surveying, what else do you need to do to become a professional surveyor? Let's talk about the national Fundamentals of Surveying (FS) exm for a minute that lets you use the title "Land Surveyor in Training." Who is considering taking that exam in the future?

6.1 Several students were able to speak knowledgeably and accurately about the requirements for taking the FS exam and the need for experience before attempting the national LS exam. Students even corrected or clarified how much experience was needed before taking the national LS exam, indicating that one year of education (the two courses they would complete by the end of the semester), passing the FS exam and one additional year of experience (or two years of experience and passing the FS exam) qualified one to take the LS exam. However, no one mentioned the need to take a California specific test to become a licensed Land Surveyor in California.

Focus Group Question 5.a. ELAC offers a course, ES 224 Land Surveyor-in-Training Review Course, specifically to prepare students to take the FS exam. If ELAC were to offer ES 224 this coming summer, what might encourage you to take it then? What days of the week, time of the

day, number of days the course met, and so forth would be of interest? What difference would it make, if any, in your considerations if the College found funds to pay the fee for you to take the FS exam right at the end of the course, while the material was fresh in your minds?

6.2. In each focus group the fact that ELAC offered ES 224 specifically to prepare students to take the FS exam had been discussed before reaching this point. Every focus group participant intended taking the FS exam at some point, although some immediately said that they weren't ready yet. The possibility of taking ES 224 over the summer was of interest to some, although not if it were offered Monday through Thursday. Some students were interested in taking it on Saturday(s), but only two to three or four students in each focus group were interested in taking the course online (if available 24/7 – i.e., asynchronous viewing video format).

6.3. When the possibility of ELAC (or the ATE grant) paying the fees ($175 per person) to take the FS test immediately after completing ES 224 over the summer was floated, interest in taking the course increased considerably. Most students seemed willing to make the effort to take the course this summer under those circumstances, although the issues of the scheduling of the course offering remained. One student noted favorably that he had participated in another engineering course followed by taking a licensing test immediately afterward. There was no consensus on the best timing although Monday through Thursday mornings or Saturdays seemed to be most preferable scheduling times for a face-to-face course.[5]

6.4. One of the focus group participants suggesting partnering with the Land Surveyors Association to make the availability of the ES 224 course more widely available. He noted examples of this kind of an arrangement occurring with other trade unions (e.g., Carpenter's Union). Other students commented that the availability of the ELAC ES 224 course was not widely known among those working in land surveying and communicating better or more widely about it might attract more students (the implication being that the course would then might not be cancelled if scheduled).

Community College Skills Certificates Versus Certificates of Achievement

Focus Group Question 6. My understanding is that ELAC currently offers two Skills Certificates in land surveying. What can you tell me about them and about whether or not you are interested in earning one or both of the skills certificates? Why might you be interested in earning a skills certificates in land surveying or why not?

7.1. Question 4 had already resulted in a general discussion of the value of a community college skills certificate and student knowledge about the Land Surveying Technician Skills Certificate I (and how to obtain it). The facilitator therefore concentrated on discussion about the second ELAC Land Surveying Technician Skills Certificate.

[5] Given the small number of people in the focus group and the lack of a general consensus, the matter of the specific days and times at which to offer a Summer 2020 ES 224 course would need further research. The COVID-19 pandemic and the possibility that ELAC Summer courses might only be offered online would further complicate a decision regarding the best strategy to follow in this regard.

7.2. Most focus group participants did not realize that the Land Surveying Technician Skills Certificate II was available if one passed ES 124 Land Surveyor in Training Preparatory Course and ES 125 Boundary Control. Before reaching this point in the focus group the earlier discussion of the problems with those two courses being available even when scheduled had already taken place.

Focus Group Question 6.a: In general what do you think about Skills Certificates awarded by individual community colleges as opposed to state approved Certificates of Achievement? What are their pros and cons?

7.1. Students in both focus groups did not know about the difference about California Community College Certificates of Achievement as opposed to individual community college Skills Certificates, so Dr. Maack explained it. No students knew for sure if potential employers would value Certificates of Achievement over Skills Certificates although some speculated that employers might value a Certificate of Achievement more because it required more courses and had statewide approval. However, the students also were sure that employers did value Skills Certificates when employing people. One student explained that the importance was that the certificate be in a specific trade or area, not whether approved just by the College or by the California Community College Chancellor's Office. Also, students were generally more interested in obtaining a Skills Certificate precisely because it required successful completion of fewer courses, so they could use it more quickly when seeking employment.

Why Students Didn't Want to Attend the 59th Annual Geomatics Engineering Conference

Focus Group Question 7. How many of you took Engineering Support (ES) 121 at ELAC in Fall 2019? I understand that Dr. Gallegos was seeking to obtain funding so that that people in that class could attend Fresno State's 59th Annual Geomatics Engineering Conference in Fresno on January 24 and 25, at no out-of-pocket cost to the students. However, no one in the class was interested in going. Please help me understand why that was the case or correct me if I am mistaken.

8.1. Only four of the seven participants in the first focus group and two of the seven in the second focus group had taken ES 121 at ELAC in the Fall semester. Therefore, the question was directed specifically at the six participants who had been in ES 121 at ELAC in the fall.[6]

8.2. Among them students surfaced five reasons for not taking up Dr. Gallegos on his generous offer.

a. For some students this was their first land surveying course, they weren't sure if they would want to continue to pursue land surveying as an academic or career interest and so saw no reason to attend a conference focused on this discipline.

b. Some students were not sure that they wanted to spend two days in a van and at a conference with

[6] That only six of 14 focus group participants had taken ES 121 at ELAC in Fall 2019 provides contrary evidence to Dr. Gallegos' assumption that "most" of the ES 221 students in the Spring 221 class had taken ES 121 at ELAC in the Fall 2019 semester and so were almost forming a cohort. However, focus group participants were self-selected among those attending class that day when concern about COVID-19 was growing. The question of the proportion of the ES 221 class that had taken ES 121 at ELAC in Fall 2019 would be more reliably explored by researching and comparing Registrar records for the two classes.

classmates that they did not know well driving to and from Fresno for a conference.

c. Students did not realize that this was a conference organized by Engineering student groups and some felt that as new land surveying students they would not "fit in" or be comfortable around professional land surveyors.

d. The details of costs (lodging, food, etc.) and who would pay them were not made clear. Students suggested that they might have felt more comfortable about going if asked to pay a small fee to cover a share of the cost.

e. Two of the six students in the focus group who had been in ES 121 at ELAC in Fall 2019 had individual conflicts on the January 2020 dates in question (i.e., a spouse's birthday and a previously scheduled trip over the break between ELAC semesters) that made the conference impossible for them to attend.

8.3. In retrospect the students recognized the potential value to them of having attended and regretted that they had not taken advantage of the generous offer.

8.4. Two other students who had attended ES 121 at ELAC earlier realized that a similar offer had been made to them and they also had not attended. Their reasons for not going were similar and they two expressed regret at not having taken advantage of the generous offer.

Internships

Focus Group Question 8. Please tell me your opinions about internships. If you plan to take an internship, when might you do that or under what circumstances?

- **a. How important would it be to you about whether an internship is paid or unpaid?**
- **b. What would you hope to get out of an internship?**
- **c. Would you consider trying to obtain an internship related to land surveying? Why or why not?**

9.1. Most focus group participants valued internships and had in fact brought them up earlier in response to focus group question 4. Those who did not speak up in favor of internships were those who already had considerable experience in engineering, land surveying and were returning to school to earn the academic credentials needed to become a land surveyor. One student who is currently working for a private for profit land surveying firm indicated an interest in an internship in the public sector only because he wanted to work in the public sector.

9.2. The importance and value of obtaining internships is in the experience that they gain doing them. For these students therefore the best internships would be those involving participation in land surveying.

9.3. While the students prefer paid internships (since all must work at least part-time), some would consider unpaid internships for the experience (if directly related to land surveying), However, both paid and unpaid internships would have to be considered in relation to their potential experience value if the student had to give up a current income earning position to do the internship.

9.4. Most of the students would consider trying to obtain an internship related to land surveying and would like to see more internship opportunities of that sort available to ELAC students. However, they recognized that student internships are very competitive. Some students started brainstorming about how to get more such internships, recommending partnering with public agencies and the Land Surveyors Association.

Suggestions for Improving the ELAC Land Surveying Program

Focus Group Question 9: In general, what suggestions would you have for improving the land survey program at ELAC or the teaching and learning about land surveying here? For example, tell me what you think of the information or counseling about the ES courses, the way courses are taught, certificate/degree availability at ELAC or elsewhere, pathways to those, financial support or scholarships, job or career possibilities for land surveyors, etc.

10.1. Focus group participants offered multiple suggestions:

a. Better counseling by faculty or knowledgeable counselors able to give Engineering specific (e.g., land surveying, land management) information about what courses to take, career pathways, etc. Some students explained that this is needed because they are the first in their families to attend college.

b. More and more varied land survey classes (e.g., related to land surveying career niches, cf. College o the Canyon offerings).

c. Better, properly calibrated equipment. Students debated among themselves the pros and cons about whether this should be the most up-to-date equipment and then settled on equipment currently in wide use in the land survey companies and public agencies.

Vision for the Engineering Department

Focus Group Question 10: The ELAC Engineering Department is interested in knowing if there is anything it might do to increase your interest in educating yourself more about land surveying or seeking a land surveying career. What's going well or not well in those regards? Any thoughts?

11.1. The last question was reframed to ask students to come up with their ideal vision for the Engineering Department, including "Out of the Box" ideas. The vision surfaced was of a department with:

a. Additional top-notch professors including more land surveying specialists.

b. Alignment of course projects with professional standards. Students asked for more specific information and instruction about "workflows" (how to go about doing the projects) and methodologies.

c. More and better up-to-date equipment typical of that used in Engineering and land surveying, including:

- land survey equipment
- GPS, drones and other equipment currently in use in land surveying
- Software (e.g., AutoCad, Surveyor, etc.)

d. More land survey internship opportunities (preferably paid).

e. An industry advisory group and partnerships with employers and professional Engineering and land survey associations.

f. More Host gatherings at ELAC of industry players, desirable employers, universities

Discussion and Evaluator Conclusions

12.1. An overall focus of the ES 221 student focus groups was on the importance to students of obtaining desirable, well-paying work, whether in land surveying, Civil Engineering, Construction Management or ownership of a construction firm. The focus group participants want to become professionals or "bosses" and feel a sense of more power over their lives and careers.

12.2. For some of the students this involves immediate goals and needs to earn more money as soon as possible, and so they want to wrap up their community college education and leave with one or more ELAC certificates that will increase their chances of quickly obtaining employment that is an improvement on the incoming earning work that they are doing now. For these students becoming a professional, licensed Land Surveyor may be an ultimate career goal, and what they are doing at ELAC involves taking the first steps in that direction, getting needed education and skills training. Taking and passing the FS exam so that they can use the title "Land Surveyor in Training" is a desirable intermediate step. These students appear not to have planned beyond that in relation to how to reach their longer-term goals although they know that becoming a licensed Land Surveyor takes experience as well as education.

12.3. For others the educational and career goals are longer term, notably oriented toward becoming licensed Civil Engineers. These students are also interested in earning ELAC land surveying certificates since it may improve their employment chances. Most are interested in taking and passing the FS exam so that they, too can use the title "Land Surveyor in Training." While most state a current interest in eventually obtaining a Land Surveyor license, for some this may be a desirable but not necessary career goal compared to their primary career goal. It is neither sufficient nor necessary to be licensed as a Land Surveyor in order to become a licensed Civil Engineer.

12.3. These different educational and career goals complicate the efforts of the NSF grant program to obtain the ultimate outcomes of having more Latinx and women enter the land surveying profession. One cannot evaluate the goal outcomes by looking only at individual course outcomes. It is not sufficient to count those who successfully pass ES 121 and then ES 221 or even the number (and breakdown) of those who file for and obtain an ELAC Land Surveyor Skills Certificate I or even an ELAC Land Surveyor Skills Certificate II as an indicator of grant success. These are at best interim potential indicators of grant outcomes. By themselves they do not provide valid and reliable evidence that the number of professional land surveyors or Latinx or women in land surveying has increased. The grant needs to be sharpened up in its focus of what it is trying to accomplish and how it is trying to accomplish that, given the different educational and career goals of students taking ELAC land surveying courses.

12.4. The grant evaluation needs to take a more longitudinal approach than looking at and evaluating students in specific courses or attending specific events. To measure grant process as well as outcomes it needs to gather student specific information on entry into the grant program, gather information on their backgrounds and intents for participation, then track what happens with

them both during their time attending ELAC and after they leave the community college. Additional evaluation data gathering approaches need to be developed, including gathering and matching student specific records from the ELAC Registrar (and possibly other offices) or developing tracking methods created with the help of the limited grant project staff.

12,2, It has recently become more difficult both to deliver the grant program and to evaluate it because of the impacts of the global COVID-19 pandemic. For example, in the evaluation findings presented in this report the reluctance of students to take online courses is documented. However, offering online course only is what ELAC was forced to do shortly after the focus group data collection took place because of "stay at home" rule and strict limits on gatherings imposed to slow down the spread of the virus. As a first-in-his-family student stated in a focus group, it is often difficult for such students to learn through online learning unless, perhaps, such learning is synchronous so that they might be able to ask and get answers to questions quickly from instructors or students. Asynchronous online learning tends to work less well for such students. However, based on this evaluator past experiences in evaluating programs during previous recessions, including the "Great Recession" that started in 2010, the economic impacts of COVID-19 on the economy and its possible future recovery once "stay at home orders" are lifted will have both lead and lag effects on the grant program, the students who are the subjects of program interventions, and the program evaluation itself.[7]

12.3. The actual impacts are unpredictable at this point. However, the PBS News Hour on April 14, 2020 presented some of the impacts on colleges and students. Current students are being denied graduation ceremonies, especially upsetting to first-generation-in-college students and their families. This year's graduates will be entering an uncertain job market that is liable to remain uncertain for several years. This is directly relevant to current ES 221 focus group participants who have been taking land survey courses with goals of improving their job prospects immediately and over the long term. Will the students seek to or be able to continue their academic or career trajectories toward becoming professional Land Surveyors and/or Civil Engineers or be blocked by the poor economy?

12,4 Focus group participants recommended several thing that the Land Survey program and the Engineering Department might do, many of which would require additional funding or allocation of additional resources to the Department and/or to expansion of the Land Survey program (e.g., more courses, more and more specialized faculty, Engineering specific counselors, and better, calibrated equipment typical of that used in the Land Surveying profession). Since public community colleges may face declining revenues next year and over the next few years for a variety of reasons, the competition for scarcer resources may become more difficult than even a month ago. A lag effect will be that public community colleges are funded primarily by reallocation of state tax revenues from the prior year and anticipated future tax revenues this fiscal year. The community colleges are essentially awarded funding in advance of their forthcoming academic year, with the state fiscal year starting on July 1, 2020 and the state legislature possibly facing difficulties in deciding on how best to award funding given only revenues from the first quarter of 2020, a serious slowing of the economy in the second quarter, and an uncertain economy in the third and fourth quarters of 2020. Revenue declines for

[7] Maack, s. (Winter 2019). "Taking Down Your Shingle? Or Not…", in Independent Evaluation Consulting: Approaches and Practices from a Growing Field, *New Directions for Evaluation* (164: p. 172-175.

community colleges may be less going into the 2020-2021 academic year but lag the more serious effects of a quite possible forthcoming recession that might last well beyond the end of the ELAC NSF ATE grant period. Community college revenues will also likely lag the time that the economy officially begins to come out of the recession, since being dependent on prior year actual revenues as well as future year projected revenues. The NSF ATE grant efforts cannot be completely faulted for these system-wide economic impacts that are outside its ability to control, although such impacts can be considered during the program evaluation.

12.4. The projected impact on job prospects for any future ELAC Land Survey program graduates and the future demand for land surveyors is very difficult if not impossible to project right now. For example, an early lead effect that would potentially increase the demand for land surveyors on one project is that the City of Beverly Hills decided to take advantage of less traffic during the COVID-19 "stay at home" orders to fast-track the progress of a Metro subway line being built down Wilshire Boulevard, a major arterial street in Los Angeles and Beverly Hills. Should a greater turnover of homes and business properties develop as an outcome of job losses, inability to pay mortgages, and bankruptcies of businesses during a forthcoming recession, the need for boundary surveys and for land surveyors qualified to do such surveys may increase. However, if public sector agency funds decline, the public agencies that several focus group participants wanted to join may find themselves freezing staff at current levels or be forced to cut staff for a while. Whether some public agencies or private companies attempt a strategy of hiring more student land survey interns (which would be a positive development for the ELAC Land Survey program) to help cover their work needs remains to be seen, as does whether any such internships would be paid. However, if ELAC students cannot find sufficient employment of some sort to support themselves and their families while they attend school, will they even seek out its Land Survey program? This program does have a built-in advantage of being able to offer marketable technical skills (if there are enough available land survey jobs are to keep demand high and pay good).

12.5. Whatever happens with the economy, assuming the NSF ATE grant money continues next year, the program administrators can focus on some findings from this evaluation. For example, while it is probable that the program has been doing a good job of attracting Latinx students (partly because ELAC is a recognized Hispanic Serving Institution in and near Latinx predominant residential neighborhoods), that could be tracked better using ELAC Registrar records and program records that will have to be maintained regardless of what else is happening at ELAC. That can be improved for the program. In addition, the proportion of women in the Land Survey program appears to be quite low and it would be a win-win for the Land Survey program and for ELAC to work with Admissions and Outreach staff to increase the number of women entering the College in order to take advantage of its Land Surveying program. Even if ELAC is not able to expand and improve its current Land Survey academic program as quickly as the students (and faculty) might like it is clear from student responses that ELAC has a built-in geographic location advantage over other community colleges with more robust programs. The Land Survey program and Engineering Department can work with counselors and Engineering faculty to improve counseling of Land Survey students – a current problem according to the focus group participants. In fact, if the student enrollment drops it might be easier to accomplish changes in counselor approaches if the workload ratio of students to counselors or faculty remains the same, falls, or does not increase too much. The ELAC Land Survey program should maintain its

current collaborative relationships with universities such as Cal Poly, Pomona, and government agencies. For example, the Engineering Department currently has an industry and public sector Advisory Council which should be continued. Consideration perhaps should be given to creating a Land Survey specific industry/public sector Advisory Council. Such Advisory Councils have multiple advantages for community colleges, and especially to their technical/professional programs (such as Land Surveying). Advantages include helping the Department or a technical professional program keep abreast of industry developments, job prospects for graduates, internship possibilities, and potentially for whatever fundraising and equipment donations might be possible. Such Advisory Councils can also be used when organizing professional/student events about which focus group participants spoke favorably and seeking professional speakers to talk to ELAC student Land Surveying or Engineering groups or specific classes. All of these efforts take time and energy to establish and maintain but need not cost a great deal of funding. The grant itself provides some funding that might be redirected (with NSF approval). The investment in maintaining good communication and liaison efforts and developing, trying out (and evaluating) new ways of "doing business" may have long-term benefits even if immediate returns on time/funding investments are limited.

APPENDIX A. ES 221 Focus Group Questions