Colorado Learning Analysis Studies

Ideas from students on making the most of their learning inside and outside the classroom

Project Report No. 2
Summer 2009
CU-Boulder

CLAS Report No. 2 available at:
www.colorado.edu/ftep/research/clas.html

Colorado Learning Analysis Study (CLAS)

Year 2 Report

Dr. Mary Ann Shea
Director, Faculty Teaching Excellence Program
University of Colorado at Boulder

Dr. Clayton Lewis
Professor, Computer Science
University of Colorado at Boulder

Dr. Sarah Hug
Research Associate, ATLAS
University of Colorado at Boulder

Katherine Byrnes
Doctoral Candidate, School of Education
University of Colorado at Boulder

Inspired by the President's Teaching Scholars Program
Initiative on Student Engagement in Learning

Sponsored by the Office of The Provost and Executive Vice Chancellor for Academic Affairs, University of Colorado at Boulder

Executive Summary

Introduction

The purpose of Colorado Learning Analysis Study (CLAS) is to determine how faculty, staff and students can improve the learning environment on the CU Boulder campus. Investigators interviewed seventy-five undergraduate students to determine what teaching practices enhance and impede undergraduates' opportunities to learn inside and outside of the classroom. For Year 2 of the CLAS project, researchers sought interview item suggestions and feedback from campus administrators, faculty, and student service officers in a Stakeholders meeting, held in early September of 2008.

The report follows a set of themes revealed in interviews, and uncovers patterns of responses, providing sample quotations from student transcripts. The executive summary serves to summarize and highlight four topics of particular interest to campus stakeholders in the fall 2008 meeting: diversity, students' experiences learning how to learn, student impressions of grades, and student course cohesion and course choice. The full report includes additional topics regarding learning, student priorities, use of technology in learning, students' learning inside and outside of academia (e.g. including work and extracurricular settings), and student recommendations to new students regarding study habits, time management, class attendance, and learning how to learn.

Diversity

Researchers inquired about diversity on campus in CLAS interviews, defined broadly in this interview series to account not only for commonly defined and visions of ethnic and racial diversity (markedly low on the University of Colorado Boulder campus), but for other forms of diversity that are explored, engaged, and enriched on a college campus. CLAS interviewees described multiple forms of diversity they found valuable to their learning and personal development, including regional diversity, international diversity, socioeconomic diversity and intellectual diversity as well as racial and ethnic diversity.

Students were asked to describe how faculty, staff, and students at CU-Boulder could better utilize or take advantage of the diversity that exists on campus to further learning. This question proved difficult for many CLAS interviewees, as indicated by their extensive pauses in transcripts, or specific description of the interview question as difficult. Students did feel the campus did a good job of promoting diversity through clubs and events.

The events and clubs usually referred to were those for specific cultural groups. Student responses convey the idea that students see clubs as being ***designed for membership*** by the students of the target ethnicity or race, though events the clubs sponsor are viewed as ***events serving the entire CU-Boulder community***. In academic settings, **small** course settings which naturally included time for dialogue among students were viewed as important in promoting cultural awareness on campus, as well as appreciation for diversity of thoughts and beliefs.

Learning How to Learn

A common response to interview questions about studying strategies revealed that students had little cause to study for courses or tests prior to college. Nearly all students said that they are better learners now than they were a few years ago. CLAS interviews probed to discover who or

what assisted students in developing superior study and learning habits of mind. Students' responses fell into three categories. Undergraduates stated that: a) campus resources (e.g. faculty, staff, and programs), b) their peers, and c) their self-directed activities for personal development led to their improving capability to learn.

Students state that professors aided their development of study strategies and skills in three ways—through one-on-one assistance in office hours, tips or hints delivered in lecture, and through structuring courses to foster independence. Teaching assistants aided students in office hours, particularly because they were able to provide an alternative perspective from that of the professor.

CLAS students mention that staff assisted them in their learning, particularly advisors, and tutors, as well as going to writing labs and study help rooms such as provided by math and physics departments. Undergraduate research opportunities also aided students' learning. In some cases students express regret for discontinuing their participation with help labs.

Students' learning and studying improve with interaction with their peers, through assistance from peers who serve as mentors and from peers who study with the CLAS undergraduates. Sometimes students were not studying for the same course, but built motivation to study when they were around other studying students.

Students Perspectives on Grades

One aspect of academic practice that is often contentious across college campuses is the assignment of grades in undergraduate courses. In CLAS interviews, we asked students what they thought about how their grades in course assignments related to the amount of knowledge or skill they gained in a course. Replies varied, from students who felt the two were highly correlated to those who saw grades and learning as two distinct and unrelated ideas. Overall, most students said "it depends"—depends on the type of course, the way that assignments are structured, their motivation to learn specific topics. Reports were mixed regarding which way the grades slant, with some students stating they or students they knew did well in courses they did not understand while others felt they had a better grasp of the subjects than their grades reflected. They also provide examples of when they felt grades were good measures of what they knew.

Courses with a variety of number and type of assignments were mentioned as particularly good at assessing student understanding, as were course assignments that allow for constructed (short answer) responses, assignments based on broad concepts of the course, and assignments clearly linked to professional behaviors in the career field. In some cases, culminating projects were described as a way to integrate many of the listed elements into a quality assignment for student learning.

Students found that their own quest for doing well in school often drove their improvements in learning. Specifically, they found trial and error and experience led to improved study skills, as did their cognitive development in their late teens and early twenties. A few mentioned developing the discipline to study. Most reiterated that college was where they learned to study, because they did not need to study in high school.

Course Cohesion and Course Choice

For the 2008-09 CLAS interviews, students described their fall semester course choices. Many students chose courses strictly to fulfill specific core and major requirements at CU Boulder. While graduation requirement was a primary motivator for most of our interviewees' course choices, students also chose courses for which they had specialized professional interest, or which they felt would prepare them particularly well for their intended careers.

Some students described a constrained choice, in which they selected specific courses among three or four options for satisfying their majors, while others lamented that their chosen major allowed for little variability in schedule. Logistical constraints that hampered student choice were busy work, study, and class schedules that forced students to take courses that fit within their free time, as well as specific schedule times that work best for student studying habits. For underclassmen, the popularity of some courses over others narrowed the list of classes in which they were able to enroll.

CLAS interviewees found academic advisors as well as faculty helpful in consulting about courses to take, recommending timing for courses, and ensuring that students had well-balanced schedules. Peers are also consulted regarding semester course decisions.

CLAS interviewers asked participants about the ways in which their courses fit together from semester to semester. Some students described the nature of knowledge building from one semester to the next within a discipline, and mentioned this was particularly true for math and science disciplines. A smaller group of students stated that these connections extend beyond one discipline into related disciplines, or across many disciplines which they found particularly helpful when courses they took in a single semester overlapped in terms of content covered or ideas discussed.

Another positive aspect of course comparison and cohesion is the way in which courses provide windows into professional ways of thinking in a discipline. According to a handful of CLAS participants, the opportunity to compare professional ways of thinking is beneficial to their learning and their professional development.

CLAS students described multiple ways in which what they learn in CU Boulder courses relate to their lives outside of the college classroom, though not all students perceived these connections. Students further along in their programs and students who were post-baccalaureate students pursuing new degrees were on average more likely both to make connections between their interests and their courses, and to see how their courses related to their future careers.

Continuing the Conversation

This summary highlights a few key aspects of the CLAS Year 2 study. The full report includes descriptive text regarding students' perceptions of learning, student priorities, use of technology in learning, students' learning inside and outside of academia (e.g. including work and extracurricular settings), and student recommendations to new students regarding study habits, time management, class attendance, and learning how to learn.

The Colorado Learning Analysis Study is designed to be cyclical, to build on prior years' responses and on CLAS Stakeholders' expressed concerns to discern how students learn best at

the University of Colorado at Boulder, find what motivates them to engage (or not engage) meaningfully in campus life and academics, and discover how they feel their courses prepare them for their futures. Like most research, this project raised as many questions as it answered. A few topics for future research include:

Students mention a self-reflective, trial and error approach to learning to study, which in some cases takes multiple semesters to perfect. How might they be assisted in developing metacognitive skills and knowledge earlier? How could faculty and staff support this?

CLAS interviewees mention a vague, though positive response to learning from diverse students and faculty. What sorts of experiences could enhance students' understandings and appreciations of diversity in its many forms?

Students describe myriad ways in which technology enhances or substitutes for text book learning and lecture material. How can they be supported in finding reliable, complimentary material online? How can professors support this new way of learning?

Introduction

The purpose of Colorado Learning Analysis Study (CLAS) is to determine how faculty, staff and students can improve the learning environment on the CU Boulder campus. Investigators interviewed seventy-five undergraduate students to determine what teaching practices enhance and impede undergraduates' opportunities to learn inside and outside of the classroom. The project is patterned after the Harvard Assessment Project, a qualitative research program that has led to many concrete improvements in undergraduate education policy and practice at Harvard since 1986.

For Year 2 of the CLAS project, researchers sought interview item suggestions and feedback from campus administrators, faculty, and student service officers in a campus stakeholders meeting, held in early September of 2008. CLAS campus stakeholders suggested topics of interest then assisted in the development and refinement of CLAS study interview questions. Student-generated recommendations form Appendix A, and faculty recommendations culled from student responses form Appendix B. A list of participating CLAS stakeholders can be found in Appendix C, and the interview protocol in its entirety is listed in Appendix D.

CLAS researchers obtained a stratified random sample of CU-Boulder students from three academic achievement levels (A students, B students, and C students) and five academic standing levels (freshman, sophomores, juniors, seniors, and students in their fifth year of study and beyond). Researchers received 756 student contacts, and held 75 student interviews with students who responded to the email request (10%). Participating students received $25 for their participation in the study. Contact names and emails corresponding to the sample requirements were provided by the Office of Planning, Budget and Analysis Institutional Research and Analysis Team.

Students involved in the CLAS study represent the following schools and colleges:

- College of Arts and Sciences
- Leeds School of Business
- School of Education
- School of Journalism and Mass Communication
- College of Music
- College of Engineering and Applied Science

CLAS interviewees represent the following class ranks:

- Freshman
- Sophomore
- Junior
- Senior
- Fifth-year Senior (including post-baccalaureate students)

The project employed interview data collection and analysis using a semi-structured interview protocol to uncover major themes regarding undergraduate students' experiences at the University of Colorado at Boulder, specifically as they pertain to learning and the campus

environment. Data was coded iteratively using NVivo software. All identifiable information (regarding student name, instructors' names, etc.) was removed from transcript data before information was coded, so that students remain anonymous in this study.

Data analysis is purely qualitative in nature—the goal is to uncover patterns in student responses, not necessarily to quantify these patterns in particular ways. While numbers of related responses are included throughout this report, these numbers only give an indication of strength or popularity of concepts uncovered in the CLAS study. As these interviews were semi-structured, many conversations took unpredictable turns, and because of this, students' responses did not correspond completely to the interview items. In other words, each student did not answer each question or sub-question.

The report follows a set of themes discussed in interviews, and uncovers patterns of responses, providing sample quotations from student transcripts. Quotes were chosen for their comprehensiveness or complete or partial conveyance of an idea. For example, a student who agreed with a question or provided a one word response is not presented in this report data as a quotation, though the response was coded to reflect the idea the student conveyed.

Technology use

Technology has become increasingly pervasive on the CU campus—some examples of this development include podcasts developed to share campus news, email as the primary means of communication, and the increased use of course management systems in online and on campus courses. The 2008-2009 CLAS study aimed to capture students' attitudes toward technology use at CU Boulder, their frequency of technology use, and the ways in which they use technology to enhance their learning experiences.

Not surprising for this generation of native technology users, the majority of students described multiple ways in which they used technology to enhance their learning opportunities, and had generally positive things to say about technology use for learning. Sixteen students specified they used technology "all the time," or "every day". Many also commented that they couldn't imagine being students before the internet.

> *"Yeah; my computer has all my notes; it has everything. If I didn't have my computer, I'd be done for… it has everything. I use it every day, maybe three to four hours for just studying purposes."*

> *"I go on-line to find various opinions or interpretations of stuff that I am reading or researching. I even keep in touch with fellow students in my classes via the internet. I am all about it."*

> *"I mean, everyone uses it all the time. It's kind of like books are becoming more and more obsolete. With the Internet, you can find just about everything online, so I mean, it's the primary source for research that I've been using. It plays every role, I mean, it's everywhere."*

A primary reason for students to use technology was to **communicate**—they described the use of technology to contact peers (11), professors (28), and teaching assistants (4). While in some cases these communications were focused on logistical concerns (e.g. absences from class,

receiving notes from other students), students also mentioned discussing course related problems and questions (e.g. homework issues, concepts from the course). While email was the preferred communication tool for most, a few students mentioned CULearn discussion boards, Facebook, and instant message services as means by which they communicate with their peers.

> *"So, I missed a lecture and I asked my… not friend; I didn't know who he was, but what my teacher did was he distributed emails earlier in the year so I went to go look for that and I just emailed some kid and he gave me the notes for that day. I talk to faculty all the time through email since it's such a big school."*

> *"Some professors are... they really like emails and stuff and they'll make that clear in their syllabus, usually. And so, those ones, they email like every week, they'll send out stuff. And, I can interact with them. And, that seems to me, like, to be the quickest way to do it. Because office hours, sometimes, it doesn't line up well. They have office hours during other classes for some of the students."*

> *"If there is a project or something that multiple students are working on we need to figure it out, which is done by e-mail because that is pretty easy. A lot of professors send out homework assignments and feedback through e-mail. That is also a good way of getting in touch with them if you want to meet with them sometime after office hours or something like that or just to ask general questions."*

Students also use technology tools to complete **research** for course projects, for papers, and for clarifying course subject matter. CULearn materials are often posted online—students find this helpful as they have all their information in one place for their reference (32). They describe the ways in which they search online throughout their studying, using search engines such as Google (11) and Wikipedia (5) to look up unfamiliar terms from the textbook or from their notes, dynamically adding to their knowledge base through internet research. For papers and more formal research, students described use of online academic databases such as those available on the CU library website Chinook (11). A small number of students mentioned that their professors recommend websites that they subsequently frequent for information (4). Students tend to trust the information they receive online—only 2 mentioned issues of accuracy on the web.

> *"I guess I use the internet quite a bit for getting peer review journal articles; especially later, getting in toward the later years and the hard classes, if you're writing about something, they're looking for those kind of sources. That's another reason. I'll do a lot of work on campus because of the CU computers. If you're on a CU computer you can get access to all the online databases…. So as far as the internet, I use the internet primarily for a research tool."*

> *"Anytime there's something I feel like I need just a little bit of information on to… before I start doing something, you know, I'll 'Google' it and just try to find some basic stuff, even if it's not from a super-reputable source, for some background."*

> *"The internet is absolutely essential. Especially because my lab courses are through CULearn. And so, everything is on there. The homework's posted on there, the tests are posted there. You know, the lab assignments are posted there; everything. We don't, we get very (few) paper document(s). So, that's a big part of it."*

Diversity on campus

Researchers inquired about diversity on campus in CLAS interviews, defined broadly in this interview series to account not only for commonly defined and visions of ethnic and racial diversity (markedly low on the University of Colorado Boulder campus), but for other forms of diversity that are explored, engaged, and enriched on a college campus. Students described forms of diversity they found positive and beneficial (and in a few cases negative and detrimental) to their personal and intellectual development.

Students described the ***types of diversity*** they are encountering at CU Boulder. In particular, they find they have opportunities to connect with various regions of the United States. They see the geographical origins of their peers as shaping students (11), and find that befriending individuals from other areas give students opportunities to explore new regions of the country.

> *"I would say regions are great. Like, inside the United States because I'm from Colorado, so it's kind of cool to meet people from all around the country. And, it's also fun during the summer and stuff (to visit other areas). So, I like to meet people just from different states and just a different outlook just from people from California, just have different attitudes and are just fun to hang out with and then it's just other different regions of the United States."*

> *"I would say it really does not matter where you are from. I am from the East Coast. Everyone here is mostly from Colorado or the West Coast, so I feel it is refreshing when I meet an East Coast person. I feel like I connect with them more than I would with a Colorado person."*

> *"Well, a lot of my friends are from out of state, and so, by going to CU and meeting people who are from out of state, it's given me the opportunity to go visit them in different parts of the country. During like fall break and summer break, I've been … a lot of my friends are from Chicago; I've been to Chicago a couple of times and also one of my friends is from California and I'm going to visit him. So, I guess the diversity here … if you meet a lot of people that are from somewhere other than where you're from, it expands your possibilities."*

Additionally, a few students referred to international diversity they have encountered on campus as a benefit to enrolling in a school like CU Boulder (10). While some described personal experiences with students from other countries or personal experiences abroad, others described their exposure to international students and international ideals as peripheral—as activities provided in which they hadn't engaged, as people they have seen but not met.

> *"I guess, my culture; I'm from Korea and so I have…I've lived here a little longer so I know both cultures; I know the culture from Korea and then I know the culture here and I can…I guess I have that one more perspective than other people can bring."*

> *"I mean, like the first day I came, I met someone that was from China and they had been here for three weeks. And, I just thought that was really like impressive that they could come to a school in a foreign country and like learn the language. And, I just knew I wouldn't be able to go to China to college.*

"I think it's important to have people from different backgrounds; other socioeconomic or different cultures, different countries. In my department I know that it's pretty important to have different viewpoints on things. The perspective of somebody growing up in China is completely different than the perspective of somebody growing up here so I think that's really important."

Additional factors that students note as contributing to campus diversity include religious diversity (8) differences in political ideals (5) variation of socioeconomic class among their peers (11) and "hometown" diversity (10), or the more specific community aspects of home life that shape individuals' perspectives. The quotes below illustrate these concepts in detail.

Religious/political perspectives

"I think it's interesting…I guess seeing all the differences; being able to compile them and grow from them. I actually transferred here; I went to private school. It was pretty much everyone… it was pretty cookie cutter; everyone was Christian, everyone was pretty conservative, everyone was Republican. It's really … I think for myself, it's interesting just to be able to be… even with the elections, just see different people's views and learn from them. Even if you don't accept them or believe in them yourself, just to understand where they're coming from and be able to see the different dimensions."

"Actually I went to high school there in Boulder. And Boulder is a fairly uniformed society. You know, not a large African-American population, not a lot of different people here, are not really presented here. So, it is nice when you get to interact with a bunch of different people. Like my sophomore year, we had a nice religious discussion that would go on in our apartment, because there was like five of us with different religious views. We would all have dinner and sit down and talk."

"I don't know. I like how there's a lot of differences in religion and stuff like that up here; it's really interesting. We have… I don't know, on our floor, in Baker, we have a lot of different people from different religious backgrounds. I grew up a Christian so it's kind of cool to see how these other people celebrate different holidays and everything like that."

Socioeconomic perspectives

"I come from a, I can't say my high school was disadvantaged but it was definitely sub-par I'm finding, or have found. I often hear stories back from other graduates and how, initially when they come in to undergraduate or post-secondary education, they have a hard time. They either move on and come back later or give up entirely."

"I think diversity in especially economic background. Because, I know that I grew up in a place that had a very standard social economic background. Everyone was pretty affluent. The reality that I had defers I think than most of America experiences. So, I know a lot of... and college students usually do come from an affluent area. It would helpful...I would find it beneficial to try to bring people in from where I was growing up.[1]"

"Economic background is good, too, to sort of get to know the different, like, economic groups in our country. Like, my roommate freshman year was in a different... Had come

[1] Note that some students do not seem to value the diversity of certain student variables, such as socioeconomic status

from a different economic place than I had and that was enriching, I think, to see that perspective."

Hometown/Community Diversity

"I think it's valuable that… because I think part of the college experience is getting out of your home town, where you grew up, and meeting new people from different walks of life that are studying different things, that think differently than you about all kinds of issues."

"'Differences at CU' is pretty broad. I have friends of all races, genders, cultures; that kind of thing. I think it's nice that I came from a small home town in Colorado where it's pretty straight forward, Caucasian, five thousand people; so it's just nice to be able to get to see different cultures."

"I find that overall; I like personalities here better than I had at home. It seems the type of people is different, but then you kind of get a… you can see people differently, kind of get a better judge of character from more practice; different people so there are going to be different characters, for sure."

Beyond background differences among individuals on CU-Boulder's campus, students value intellectual and disciplinary differences in the ways students solve problems, approach new ideas, and make sense of the world. CLAS interviews indicate that intellectual differences among students (17), in some cases related to individuals' discipline of study (4), are valuable differences that enhance the campus experience.

Diversity of thought, general

"I think it is important to have the cultural diversity and intellectual diversities as far as people who think different ways about things, so you can kind of get exposed to different ideas that are out there."

"I like...I don't know, I like learning about new ideas, and new ways about thinking about things because everyone has different ways of...it is kind of nice to get away from like my high school where everyone kind of thought the same way, and did the same things, so.. I value like the differences a lot."

"I value just people having different opinions about everything. People speaking out and saying how they feel, respecting that. Basically, people like to do different things. There is a lot of different things here that people like to do here I noticed. Just basically people having different values in their education, what they want to do with their lives, and talking to other people about it and letting people know."

Diversity of thought, discipline specific

"So, instead of everybody being interested in one department within the school, we obviously have various departments, various schools, anything you can choose from arts, sciences, anything."

"Well, for me, I study philosophy at the University, so for me, intellectual dispositions are very important because they tend to characterize kind of which school of thought people tend take up. And, they often tend to give some kind of background information to the types of education that they might have had or just to the world view that they have and

what comes along with that tends... I tend to see a correlation with one's world view and the way that they engage with other people and the way they interact with me and other faculty and community around me. So, more than anything else, I think that's probably the thing that I look for among people."

"I think part of the college experience is getting out of your home town, where you grew up, and meeting new people from different walks of life that are studying different things, that think differently than you about all kinds of issues; from social, political, whatever it may be. I think it is important to have the cultural diversity and intellectual diversities as far as people who think different ways about things, so you can kind of get exposed to different ideas that are out there."

Finally, CLAS students did address the notion of ethnicity and racial diversity on campus. Fourteen students mentioned differences they experience in their campus environments, though in most cases these descriptions paralleled international diversity rather than a specific focus on racial or ethnic differences among US citizens. Again, knowledge of differences in race are at varying levels of engagement—students mention knowledge of student groups, seeing people around campus from different backgrounds, and a few discuss personal interactions with individuals who do not look like them. These personal interactions were viewed by students as particularly important for capitalizing on diversity that exists on campus, and are cited in research on diversity as an aspect of sociopolitical attitude development of young adults (Antonio, 2001; Pettigrew, 1997; Sidanius, et.al., 2008). The few comments that did not overlap with international descriptions of diversity are listed in quotes below. Note some students mention that CU-Boulder could expand racial/ethnic diversity.

"And the race difference is pretty neat to see (on campus) also."

"I always know every year that I've been here that a lot of the Latino or Hispanic, sorority I think it might be, like Pi Lambda Chi, that does a lot of the things where they bring heritage and they'll do the food ***(unintelligible)*** *the ethnic advisory kind of things on Northern Quad or they'll bring the dancers and it's something that I always feel is present."*

"I have friends of all races, genders, cultures; that kind of thing. I think it's nice that I came from a small home town in Colorado where it's pretty straight forward, Caucasian, five thousand people; so it's just nice to be able to get to see different cultures."

"The obvious answers that sort of come to mind when I think of diversity is like racial diversity which is maybe something that we could work on here at CU."

Promoting Student Learning/Development through Leveraging Diversity

Following the above interview question, students were asked to describe how faculty, staff, and students at CU-Boulder could better utilize or take advantage of the diversity that exists on campus to further learning. This question proved difficult for many CLAS interviewees, as indicated by their extensive pauses in transcripts, or specific description of the interview question as difficult.

First and foremost a handful of students believed that increasing diversity on campus was needed in order to take advantage of diversity in a more robust way (6).

"I mean, one thing that I would like to see more at CU is diversity because there's not very much of that and that's, you know, also Colorado also."

"Oh, that's so hard because it seems like sometimes this campus is so homogenous and very similar. I think it would be good if there were more opportunities to maybe learn about different groups that aren't very represented at CU. Since everybody is so similar."

"I do wish it was more diverse. I think there's too many white, upper-middle class students on this campus and not enough ethnic diversity."

Additionally, a small group of students mentioned that they felt CU-Boulder currently celebrated differences to a strong degree, and so the students had a difficult time coming up with new ways to take advantage of diversity on campus (5).

"I think it is all up to the individual student. There is plenty to do. There is plenty to participate in. Just walking around campus, just the chalk everywhere."

"Not really; I've seen a lot of stuff, especially… I've only been here two years but I know there is, like during Passover and certain Jewish holidays, there's always these functions put on by the UMC. I guess they're really cool; I don't always attend all of those, obviously, but just the fact that they're open to different people. There's even clubs for everything I could think about. I think they do a pretty good job of diversifying; that kind of thing."

Some mentioned that there were many events and clubs for diverse students on campus (8), but there could always be more such clubs and events (9), or better promotion of such events (7). The events and clubs usually referred to in this section were those for specific cultural groups. Student responses convey the idea that students see clubs as being ***designed for membership*** by the students of the target ethnicity or race, though events the clubs sponsor are viewed as ***events serving the entire CU-Boulder community***.

"I guess by maybe… I think there already are a lot of things like it, but clubs and activities from certain groups that are more meant to engage other people. There's a lot of groups that have functions with their group, but are kind of ***(unintelligible)*** *of including or have the purpose of including others."*

"Well, I think one of the things that's really good is that you kind of have all of those different clubs and groups that you can be a part of, so you can kind of get to explore different sides of things. And so, I think so far, the school's done a really good job of that, so there's kind of different activities that everybody can kind of be a part of and get to explore stuff you've never really done before. So, maybe even more clubs and stuff like that."

"But if there was a better way of getting out information; I know they do the CU emails but a lot of times that's just seen as spam and you go through and just delete it. So, I don't know if there could be a more effective way but I don't feel like the emails, the Student Buff bulletins and things like that; I don't think that's efficient because a lot of us, I know – my sister goes here, too – we just delete it, don't even read them."

According to a few CLAS interviewees, the best events to promote diversity would be hands-on,

allowing students to experience different cultures and ideas in a less structured environment than they would in a classroom (3).

> *"It would be cool if classes like that had like, fields trips, or some sort of real experience where you could do more than just look at pictures and slides of other cultures and different people."*

> *"Well, in Baker, personally, we have a bunch of programs that kind of just focus on different things the one with…that was on race, they did this game where they gave us these different symbols and we were supposed to find out what race that we were. There was like blacks and Mexicans and whites and all these other people. Their communities rebuilding were all different and like different races and stuff like that. There were prizes and stuff that they gave out so it's kind of cool. They always have somebody talk about it, too."*

Promoting diversity in the classroom—dialogue, curriculum, and faculty endorsement

Interviewers probed students further about how their courses might better take advantage of diversity on the CU-Boulder campus. According to the 2006 National Survey of Student Engagement (NSSE), freshmen and seniors at CU Boulder rated their college experiences slightly below average regarding the "the extent to which their experience at CU-Boulder have contributed to their knowledge, skills, and personal development in understanding people of other racial and ethnic backgrounds" (University of Colorado at Boulder Office of Planning, Budget, and Analysis, http://www.colorado.edu/pba/surveys/NSSE/06/index.html, retrieved July 23, 2009). While some felt the classroom was no place for such ideas (2), and that individuals should decide for themselves how to take advantage of diversity for their personal and intellectual development (6), overall students mentioned three specific ways issues of diversity could find its way into classrooms.

Small courses which naturally included time for dialogue among students were viewed as important in promoting cultural awareness on campus, as well as appreciation for diversity of thoughts and beliefs (5). In addition, professors in classes with dialogue could actively encourage students' formation of diverse groups (5) for projects and discussion purposes. In some responses, it was clear that students felt *all* students had a divergent or unique point of view.

> *"I don't know if there's, if there would be any legality or stuff issues with… like if you were forming groups for a project in class… I've had it before where I've had professors request that you had at least one female in your group to spread things out a little bit and get some different perspectives; as long as you can do that kind of stuff without crossing any other type of boundaries."*

> *"I think that in like smaller classes, it is good to like have discussions so people can say what they feel about different issues and then that kind of gives people the opportunity to share their point of view about things, and then the classmates can learn."*

> *"Like, I'll make a connection in my head with an experience that I've had, but I won't necessarily share it. I guess, for one, because I guess I want to be modest about those experiences. Instead of being all like, "While I was in Mongolia, blah, blah, blah, blah, blah..." But, I guess there are certain ways to go about saying... Like, even, I can change... Without inserting myself, I guess I can say, "In Mongolia, blah, blah, blah, blah,*

these people do this." But, so I guess just encouraging--somehow, I don't really know how--but, somehow encouraging people to speak up about their experiences in the classroom setting."

"I guess (we could take advantage of diversity) by asking people about it. Probably just telling people, "Do you want to share your story?" Because everybody's got a story and everybody is divers in different ways and they don't… it's a sensitive subject; you don't want to put somebody on the spot or anything but if you're like, "Do you have a story you want to tell?" I think that's really… because I did something a while ago and they asked us that. It's amazing because everybody had a story and it's just like you don't hear those unless somebody asks."

Course curriculum was another way in which students felt CU-Boulder could take better advantage of (and become more aware of) diversity on campus. While one student felt a required course would be best, two more found that diversity could be explored throughout the curriculum (2), or through courses offered about specific cultures (1). A small group of students found that taking courses from different departments (4) than their major department increased their understanding and appreciation of intellectual diversity.

"Using different departments more often, being able to... There's such an unbelievable pool of resources here and to stay within your own department always, if you're a student or if you're faculty, it just doesn't make sense. You have... Any university, you have more resources than just about anywhere outside the government. And, it just doesn't make sense to spend so much time looking at one thing when you can have a broader perspective."

"I am actually taking some really cool classes. I am taking New American Religious Traditions and history of Southeast Asia, and there is a lot of like diverse group of people."

"I think that teachers should explore, you know, their field and try to find diversity on build of things. It is easier, I guess, if you are in the humanities to find different types of writers, artists, and things like that. And even in science. You know, highlight achievements by minorities, different religious groups, whatever."

Finally, one student thought that the best way for faculty to support diversity inside and outside the classroom was to advocate for student participation in extracurricular events focused on diversity, and another mentioned that faculty-led events regarding diversity of thought would be a draw for students.

"I've never heard of a professor activity. It's never like, "Oh yeah, a bunch of us professors are putting on this event." That would be so cool. Like if the English department put on an event; the professors, not just student run. We're more than just a student community I think."

"I had a class last year where it was like a freshman intro class to living in college; the teacher was always telling us about events that she thought were cool. That brought us closer to her and then brought us closer together as a class and it brought kids to events that we, as a group, would never have attended together."

Student Priorities: "Big Pieces" of Students' Lives

CLAS participants balance multiple roles during their years in higher education. According to interviews, undergraduates balance work (18) social lives (38) volunteer positions (7), clubs and activities (35), all while trying to excel in coursework (31).

Working outside of school

Twenty seven employment positions were listed during the CLAS interviews, a number that is a bit lower than expected, based on current trends in college age adults. Two factors may influence responses about jobs—a) the wording of the interview question focused on meaningful and valued ways students spend their time, and some students remarked that their jobs were seen as means to an end, not necessarily important aspects of their lives. Secondly, the interview respondents may be skewed away from students with paid employment, as participants received compensation for their time in the CLAS interview.

Nine students mentioned having a job, but did not go into detail about the work they did. Of those who described work outside of courses, nine positions were off campus jobs and nine were on-campus. One third of all jobs were related to the students' discipline or field while most obtained jobs that merely paid the bills.

> *"I am very involved with my church. I actually work for them. I had up to three jobs at one point, delivering newspapers. I was working on campus building satellites, so it was a lot of work, which was a little bit too much."*
>
> *"I've always had to work and most semesters I've worked a full time job."*
>
> *"I have a really great job where I can do homework at work."*
>
> *"Running my home business; that's a huge piece. Trying to delegate a lot of that stuff now so I can make the money and not be able to work. I also still work for Celestial Seasonings, because I believe it's really good for … to be humble and always work an hourly wage job. I'm in college; maybe the paying thing doesn't work out one summer. I still have a job and I'm still ok with manual labor."*

Forming and nourishing social relationships

Not surprisingly, students mention the time they invest in social activities on and off campus (38). They describe ways in which social relationships have become more and in some cases less important as they further their academic careers.

> *"I live with three other girls and right next to us are four of our guy friends, so we hang out a lot."*
>
> *"I guess creating relationships is really important. You can just study, and study, and study but it's not going to get you anywhere if you don't socialize. You can meet new people and create those relationships; some of them long-lasting. I think that's really important for success and what not."*

"I mean, just like the experience of meeting people, I think this is the one time in your life that you're like crowded with so many people of your own age, so it's kind of like... I think the, yeah, probably the social experience."

"But, you know, then it's a matter of, you've gotta be happy here in order to enjoy your time, so you have to be able to socialize and go party and do all the things that most kids like to do. If you don't like to party, that's cool. You don't have to party."

"Well, a couple of biggest pieces... The connections like I've made with people are definitely a huge one. Kind of people that have helped shape me or helped me grow through the time that I've been here which translates into like myself, I'm like growing as a person like on an individual basis."

Volunteering in the community

A significant number of students participate in volunteer activities during the time at CU-Boulder (7). Students work with youth in most cases and with community organizations as well.

"I do a lot of volunteering; like I own my own non-profit organization. Starting in December I have a job that's from 7:30 at night to 7:30 in the morning, two nights a week; it's the emergency warning center, for the whole month. That's kind of volunteering and a job at the same time."

"Odyssey of the Mind is basically K through college. There is no age limit. It's a creative problem solving sort of thing to where, you know, August/September you can choose one of five problems that the association puts out. Basically, they all have $125 cost limit and what you have to do is solve the problem within a skit; it's within an eight minutes or less skit. Then you present it and competing with other teams. I'm kind of an assistant coach for my little siblings, and I'm a State problem judge for that."

Participating in extracurricular activities

Undergraduates attend campus events, participate in intramurals as well as professional and semi-professional sports, engaged in academic and hobby related activities while on campus. Some of the CU-Boulder sponsored groups described by interviewees were:

- AMSA
- Hebrew club
- Hiking club
- Baker resident academic program
- Campus bands
- Track team
- Intramural teams
- Hall council
- The greek system (fraternity, sorority)
- Christian challenge
- Engineering honor society
- Engineering counselors

Additionally, fifteen students mentioned outdoor recreational activities, spanning track and field,

professional bicycle racing, the CU football team, skiing, rock climbing, snowboarding, and hiking with friends.

"Class is the most Important-it's why we're here"

Despite multiple priorities, when asked to prioritize their time, over half of the students interviewed said coursework was a priority (31), including time they work in courses inside (12) and outside of class time (13) as a significant, or the most significant, activity in which they engage. One student described how his extracurricular activities dovetailed with his coursework, reinforcing interest and relevance.

> *"My focus at being here is school, going to courses, you know, taking advantage of things here."*
>
> *"School is obviously important. It is sadly becoming less so the longer I am here. If I fail a test, it is not going to even...at most it will ruin my day. Not more than that. It is only one part of my life, and I know that this is my time for going to school, but nevertheless its only one part of my overall life.*
> *"*
> *"The big pieces right now are certainly going to class. I spend quite a bit of time doing class related things. In the past, it has been also a lot about socializing."*
>
> *"School is definitely the most important, but closely followed by like relationships with my friends."*
>
> *"I guess I'd have to say classes are the most important, but the least exciting. The thing that really keeps me interested (in my discipline), like my interest in general is the project team. That's kind of like what I would do with all my time if I could."*

Students' experiences with adults on campus

In some of the important elements of students' lives, CLAS participants remark that they have the opportunity to develop relationships with adults (those older than the typical college student), particularly with professors and TAs and at their jobs. Twelve students lament a lack of opportunity to form relationships with adults who are significantly more experienced.

> *"Well, I haven't known many of them too long, but I think my assistant-ship with my philosophy professor has been really good because it's kind of made me more comfortable with professors and like asking them questions and kind of working with them on different things because I know for med school eventually, you need to be able to go and like ask for research opportunities and things like that. And, at first, that sounded like insanely intimidating and I was like, "Oh, I can't go talk to a professor," but now that I've kind of worked with him, you're realizing that they're not all so scary. And so, that's been really good. I don't really know too many of my lecture professors too well. I like that the TAs are younger. They can kind of understand because like it wasn't too long ago that they were kind of in the same thing, so they can explain it in a way that you understand."*
>
> *"Some of (my co-workers) are students, but most of them are they like are there full-time, so I go in Tuesdays and Thursdays like today for a couple of hours each time, for work studies, and like just help out a little bit. But, like the teachers in the classrooms I work*

with, they are full-time staff. But there are like a couple of other people similar to me that I know of, who come in every once in awhile. But most of the people I get to know are like the full-time staff because like the class I work in is smaller, so they wouldn't have like more than one work study at a time."

"Well, I have a little trouble with talking to professors, personally. Just, I feel talking to professors is really different from talking to regular people. I get nervous. But, like, my manager, I love my manager. She's really nice. I'm okay with other... Like, my advisor, I'm okay with her and other people, but just with professors are the trouble."

"I definitely have more of a relationship with older students and professors since I've been working in the Geography department. I know almost… I feel like I know half the department."

"(I interact with them) every time that (adults) go swipe into the rec center. I live in Bear Creek, so those people typically work out the same times every week. You kind of know them and everything. You see them walking around. Again, in classes for teachers it is big just because you go to their office hours. Who knows when you will have to get a recommendation letter for things. I think that was bigger for me in high school in the small environment. This large, large environment is a little detrimental to that. There are so many kids and so many teachers and everybody has to be somewhere all of the time. It feels busier the bigger it is. You can still build those relationships with the faculty but they take more work because you have to stabilize yourself a little bit."

The impact of positive and negative academic experiences on future careers, study

Interviewers asked CLAS participants if they had experienced a life-changing event on campus. In most cases, the question was clarified in interviews to address academic or career decisions, insights, or discoveries that students made in the course of their careers at the University of Colorado at Boulder. While only a slight portion of student participants mention this sort of event taking place so far at CU Boulder (8)[2], the impact on student academics and career choice they report when they do occur is substantial. This section delves more deeply into student responses to uncover a) events or experiences which held great impact for students and b) the resulting change in behavior, attitude, or intention for students.

In CLAS interviews, students describe how in-depth courses assist their decision-making regarding where their passions for career and academic specialties lie. Two students describe how experiences in a course dissuaded them from specific career paths, one of whom sees an opportunity to study in another related area.

"I started as an Astrophysics major and have liked it. Maybe one thing is Experimental Physics. I did alright in those courses. I definitely thought to myself, 'I'd rather not do experimental work and more theoretical.' So, yeah; (I gained) especially more direction. I don't know if there's a dramatic change in that; like I wanted to go into Experimental beforehand."

[2] Many of the freshman we interviewed answered the question about life changing events with "Not yet", perhaps indicating their openness to such an experience and/or their assumption that they will experience such an event

The student above was able to narrow his career interests following exposure to elements of the astrophysics field. Though he remains a student in the major, he is now focusing on graduate school to further his career in the theoretical physics arena.

> *"Well, I've had some courses that have made me reconsider majors, so I always thought I was going to, you know, be a doctor. But then, I took Chemistry II and that was a little too difficult for me, so I guess it has probably changed my life path some."*

Course experience can also close doors for students' aspirations—in the above quote, an undergraduate decides she may not have the skills to pursue medicine, based on her experience in an introductory chemistry course. It is impossible from this data to discern whether her skills and abilities are well suited to medicine, though this weed-out phenomenon she experienced is referenced in higher education literature, in particular in the sciences, and may afflict underrepresented students (e.g. African American, Hispanic, Native American, and female students of all ethnicities) and to a higher degree than majority students in the sciences (e.g. white males)[3]. It seems doing poorly in a science course changed the course of this students' academic and career path.

For some, academic opportunities lead to excitement and broadening of interests. Three students mention how CU Boulder course offerings and content of lectures narrow aspirations and assist students in clarifying their future careers, leading to graduate school opportunities and specialization within CU Boulder majors.

> *"I guess I have always thought I wanted to do something with languages. At my other school we actually-- they only offered Spanish which I've already taken pretty extensively. I guess having the class offered has really…I'm actually applying for grad school right now for Japanese and International Business…So, having the classes there has changed my course, I guess."*

The student quoted above found a new area of study among language study, and also developed a complimentary expertise at the University of Colorado at Boulder. The student mentions that the majors were not offered at a previous institution, and so the diversity of majors at CU Boulder led to a new career direction, as well as a new graduate school program focus.

> *"I wanted to go into psychology since I was in high school. I think I want to get into like possibly clinical and possibly developmental. For the past three years, I have worked with small children and I really liked the Abnormal Psych class, so I am thinking about combining those."*

Although the student quoted above was clear on her general field of study, a course in abnormal psychology in combination with work experience with children helped her narrow her interests, and gave her a more specific field in which to develop academically as well as professionally.

> ***Student**: Actually, pretty recently in my Foundations About Engineering class, we have been learning about tissue engineering, and I kind of been deciding about what I want to*

[3] Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development. (2000). *Land of Plenty Diversity as America's Competitive Edge in Science, Engineering, and Technology*. Washington D.C.

do in terms of a career and that is just what we have been learning about is really interesting to me and I am actually trying to pursue research in it, for an undergraduate research.
Interviewer: *That's good. What was the activity or what was the moment where you decided it was interesting? Was it a lab? Was it reading?*
Student: *It was during a lecture, it was a whole lecture on like stem cell research and all different kinds of things you can do. We watched a video on it. I was like this could help a lot of people. I thought that it was really interesting.*

An engineering student decided on a specialized area of engineering based on a course lecture. This specialized course is designed to give students in-depth views of particular fields in engineering. For this student, at least, the course led to increased engagement and interest in tissue engineering during the course of a lecture highlighting how the field can help people. This notion of "helping" careers is studied extensively in career research, particularly in science, technology, engineering, and math fields, and in the case of this student, the notion of being in a field that could aid humanity resonated, leading to a better defined career aspiration in engineering.

Additional impacts upon students include courses that challenge ones' study habits and motivations to improve in college, courses that encourage students to examine their own and others' beliefs critically, and adverse events that opened students to new career opportunities.

"I guess maybe first semester last year, like I said before, there were a few times I was like, 'I need to change the way I'm studying and I can't just, like, expect to maybe show up to class and be able to absorb everything, I have to be able to expect to do some work outside of lecture and presentation and everything.'"

Overall, CLAS participants described a need to learn how to study and to make courses a priority in terms of time and effort. The student quoted above found in the first semester of college courses that "just showing up" would not lead to college success-that additional time and effort must be paid to do well in higher education. This student described this realization as a turning point in an academic career.

"I've had realizations…A lot of challenges. I consider myself a little bit more moderate than most of CU Boulder, so some of the classes that I coined... Sort of more like left-wing agenda classes. Those ones really challenged me because I had to study really hard and figure out exactly where I think that it was a little bit, not as... presented in a different light than I would probably see them in."

The University of Colorado at Boulder is often described as a particularly liberal college campus. According to the CLAS participant quoted in the above selection, the liberal leanings of courses and professors challenged the way the student thought about political and other social issues. The courses he described, while pitted against his own beliefs, provided an opportunity to solidify his own understandings and critically examine issues from multiple perspectives.

"Well, I came to CU and I started in the Air Force program, ROTC program and I wanted to be a Fighter Pilot. A few months in I got medically disqualified from the Air Force and I was really bummed out because I'm like, 'I can't be a Fighter Pilot.' But, since I am very drawn to renewable energy and things, like addressing global climate change; I feel like that's my calling. ..It was probably sometime between my junior and senior year; just

getting into some of those more technical, elective courses where you get to choose; it's one of the first times where you get to choose what courses you're going to take, like an Engineering course. I guess, yeah, just getting into some of those and realizing, 'Wow. That's a problem my generation has to deal with and I want to be a part of that.'"

A CLAS participant found that disappointment can lead to new avenues for study and work. After being disqualified from the Air Force program, a negatively life-changing event, he discovered his interest and passion for developing new forms of energy through engineering. His technical electives in engineering led him to this self-discovery of a new calling.

Learning Outside of Class

Learning for future careers, for personal development outside of school

In the 2008-2009 CLAS study, interviewees were asked to describe current experiences in which they were learning non-academic skills or knowledge. Next, they explained then compared the process of learning in those instances with learning for college coursework.

Students were learning for hobbies (11) and in their jobs, whether they were related (7) or unrelated (9) to their fields, as well as in extracurricular activities on campus (3).

"When I first got started (running my non-profit organization), I had to learn the developmental levels of children because I worked at The Children's Hospital. So, a person's age isn't necessarily what's appropriate for them because of the different developmental levels; so that was something I had to learn. I traveled to Thailand this summer and taught English to second graders and so I had to learn a language that I was unfamiliar with. You learn how to be comfortable in different situations."

"One of the biggest things that I'm doing on my own right now is trying to get that website up and I've done some website building but not to this level. So that's sort of like… and I'm doing it myself. My mom does website stuff so she can help me but it's kind of nice being able to just do something that you want to do and do it for yourself and learn it for yourself."

"I go over to the Elementary School twice a week and work with the kids and I'm teaching them about nutrition but you also learn to work with kids that age and how they respond to different things. I'm actually working at Uni-Hill, so it's a bilingual school; so, I pick up a little Spanish, too."

The most often described learning students were engaged in outside of course learning was the development of life skills (9), or more specifically how to balance their finances (5), serve as leaders (3), manage their time (6), and most often, engage in positive social/interpersonal interaction (23).

"I think at work I do, like how to work with people and like different stuff like that that really doesn't relate to specific course work. And like before, I had like a managing position, so I learned more leadership skills, which does not really relate to course work. I have definitely learned things from like my working experience that you wouldn't learn in class."

"I definitely think from, for example, my job, as I waitress a lot, like human interaction obviously. So you learn how to interact with people well, because that is definitely a skill

that you are going to need in order to get a good job, do a good interview, and things like that."

"Cooking has been a little experimental. It is hit and miss for sure… I think that is part of the fun of college. Having to borrow things from your neighbors. Even our sink got clogged. Just trying to figure out if we call maintenance they will probably be here in 1-1/2 weeks so what can we do. That is just growing up I think. Adapting to all of that; meeting new people. Adapting to the new people that you are not familiar being around. Learning how they work. Outside of class learning is just as important obviously."

CLAS interviewees next described how they were learning non-academic skills and knowledge. Some common themes emerged from the data regarding how students conceptualized learning of their out of school topics. According to interview data learning was experiential, or "hands-on" (20); students also stated non-academic learning tended to be less structured and more exploratory (8). Overall, the notions of ***passive, structured learning for courses*** and ***active, exploratory learning outside of class*** prevailed in the interview data. It is important to note, however, that throughout the interviews students spoke of specific course activities that they deemed hands-on, exploratory, and engaging.

"Yeah, I feel like it's a different process (to learn outside of school) because you're not just trying to learn information and how to make information in a good way for an exam, but skills that you can keep using, in a lot of different contexts. Whereas, things that I learn for exams, I often don't think I'll ever use them again or remember them again. Whereas, learning to work with people in groups to communicate better- I think that's something that you use every day."

"Because the learning outside of classes that I do is very much experience, hands on. You know, I learn by, you know, messing something up that I just did, or you know, doing something in the process of somebody telling me how to do it. In the classes, we get a little bit of that and they try to bring as much of that in as possible, you know, especially with the labs. But at the same time, you know, we have the lectures and stuff and that's purely, you know, just reading and seeing it done."

Students said that they found outside of school learning to be based on practice (7), as well as feedback from more capable others(6) and observation of more capable others (3).

"I think with other types of skills. Like I used to watch other people and see how they do it, and then try and do it myself. I guess is kind of similar, in my class like I listen and try and conceptualize it myself, so I put it in my own words, so that I understand, which is kind of the same thing, but in a different way."

"In class, you kind of just listen to what one person says and you take notes and you kind of focus on that and read the textbook and listen to everything they say and it is more kind of just like taking what someone says and writing it down and memorizing it and learning. The other way is just kind of learning through experience and believing your own opinions about stuff and just dealing with things and trying different things and thinking everything out for yourself."

The motivation to learn outside of school is often intrinsic—students said they had a harder time continuously working on skills (such as those for hobbies) outside of courses when there were no

deadlines and no rewards or punishments (in the form of grades) to push them forward in a task they learn outside of school. However, in some cases the learning they do *in situ* is practical, and skills developed through trial and error in everyday situations, such as living with a roommate or cooking their next meal. While the varied structures of the courses they take do force continuous engagement, students expressed a more active orientation toward outside of school learning.

> *"Well, school learning is strictly, 'This is what we're going to do; this is when we're going to do it.' It's like a linear, 'here's your timeline for the rest of the semester.' The other things I'm learning are, you have to pick up, you be intuitive; you learn as you go."*

> *"You don't-- it's not like, 'Ok, Tuesday we're going to learn how to cook; Wednesday we're going to learn how to pay bills.' It's just kind of like, 'Oh, I'm hungry; I have to cook. Oh, there's a bill I have to pay.' You kind of learn as you go as opposed to kind of structured learning, which I feel at the moment, that is what I'm doing in school; it's very structured learning."*

> *"Well, when you do something on your own, you definitely have to want to do it. And school sort of helps you just like, 'Ok, well you have to do this,' so just push you along. But, in school it's more like you have to keep going with it, whereas if it's just a hobby, you're like, 'Oh, I'll just take a week off,' and not even bother with it. And then, like in school, you make sure that you learn all of the different components. Like, I'm sure if I was taking a website building class I would be learning it faster and more rounded, everything that needs to be learned that goes into it rather than just what I think is important. But I don't want to take a course on website building-- I'll just do it myself."*

Learning something especially well

A major focus of the CLAS study is to understand how students conceptualize learning and the myriad learning experiences offered at CU Boulder. This section of the CLAS report focuses on students' descriptions of experiences in which they learned a concept or topic "especially well". Students described the processes by which they learned the topic, as well as how they recognized they knew a topic to an exceptional degree. The variety of responses to this interview question is important to note, indicating that students learn best in a diverse set of ways. Often, students spoke of specific courses or elements of specific courses when discussing what they learned especially well. Of the 75 students interviewed, researchers found that over 20 ways to learn well were described. Answers were coded then categorized to reveal more generalized themes.

Engagement in applying knowledge, inside and outside the classroom

CLAS interviewees described particularly powerful learning experiences in courses, labs, and outside opportunities such as work or extracurricular activities that compel students to apply the facts and concepts they learn to physical or social phenomena in everyday life (18). Students listed laboratory experiments, course exercises that encourage knowledge application in practical problems, and learning experiences that are expressly tied to career applications as ways in which they were able to apply knowledge for course learning.

> *"I guess one of my biggest accomplishments would be this semester in my journalism class, which is one of the first classes that I have taken pertaining to my major. I have learned so much about how to work in television. It totally changes the way that I even*

watch TV, movies, and anything anymore. That is how I know that I have learned something is just because I have a lot more critical eye of these things. It is all because of the hands on."

Student: *Again, it is the hands on thing. I think a lot of teachers that stand there and talk are so knowledgeable but sometimes I do not absorb all of it until I actually get the chance to use the information and the knowledge that I have gained. A lot of times I end up leaving a class not really having the most out of it because I never got the chance to use it.*
Interviewer: *Is there any example from this class of a hands-on thing that you found really meaningful?*
Student: *Everything that we do is hands on, the camera equipment, the switching equipment, all of it, and just the fact that they explain it and then we get the chance to use it really helps it stick.*

"I guess in Computer Science we talk a lot about encapsulations, so like you have certain information that is important, some code, so you want to put it all in one place so you're not modifying code everywhere in order to fix it. So, I have a job on campus and one of the things we had to do was write some programs so I've kind of incorporated that method into my coding and then, I guess that's how I know I learned it."

Students found that frequent opportunities to practice procedures (11) or complete homework assignments (4) in a course enhanced the amount of information they were able to retain. These results suggest that professors who use formative assessment, or feedback, throughout the semester, rather than only at the end of a course, support student learning (Gibbs & Simpson, 2004; Wood, 2008). The practice and repetition was deemed vital to their success in learning concepts especially well.

"Well, in Economics, I feel like I learned better than in other classes because I do a lot of example problems and that's what helps me learn a lot. I don't like doing example problems, because they take more time, but I think doing a lot of examples really helps me to learn personally a lot better and allows me to do better on exams and stuff because I've seen more of what they could ask and how to answer those questions."

"Lots of homework (helps me learn especially well). I hate homework but that's really the only way that I can actually truly learn a subject instead of doing the reading; reading through examples, you're like, "Oh, yeah. I know it." Actually doing lots of homework is the best to know that you actually know it."

"I guess I know that I know it because I can recall it instantly; I don't have to sit there and think over it for a long time. Generally, I guess how I learned it is just through repetition; a lot of work, a lot of homework and just ***(let it sink)*** *in."*

Traditional, time honored learning methods, such as reading texts and articles assigned also worked for some students (12). They found when they were motivated to put the time in to read carefully and learn the material, they were able to achieve in school.

"Doing the reading, doing the homework they assign. I'm a pretty traditional learner. And also, I think I get a lot... I enjoy learning more and probably get more out of it when I try and put myself into it and ask myself why this matters to me."

"I took a really interesting course on the brain from the MCDB Department and we read a lot of articles that, like sort of review articles, so they weren't too much to understand. And there was a really interesting one about Autism. And I was able to explain to a family member who works with a guy who has a very mild Autism, like a functioning one, about these differences and I think that it helped to understand, like, there's nothing they can do about it. You have to be more direct or more careful and it's not like… it is like a disability but something that you can, by understanding it you can learn to work with it better."

"(I learned the subject) because I put the time in. I think you have a generally better feeling once you know you've done the work that you can do to your ability. Through sitting and reading in the library and doing it, just cranking it out. I dedicated more time and I took more time looking at the information instead of rushing through it."

Learning from experts- students learn by listening, talking about subject matter

For some students, the traditional lecture is effective for imparting course material, particularly when the lectures are well structured, dynamic, and enthusiastic (5). In some of these lectures, students feel professors and instructors explain their subject particularly well (5). Other CLAS interviewees explain that they learned material via one-on-one discussion with professors or TAs (2), or in discussion with peers (3).

"The one I'm in right now is Spanish…there were only like twenty to thirty people, you could actually ask the teacher questions you could understand. A lot of times there's just a small snag and if you're able to get that snag out of the way, you can really move on."

"I guess also part of it is how well the instructor conveyed what she was trying to teach; she put it in terms that everybody understood and almost on a personal level. For each student she related it so each student understood it specifically. The understanding level that she had, she seemed to be really knowledgeable about it; the more she knew the easier she was she was also able to convey it in an understandable way; instead of just not as opposed to knowing a lot about it but not being able to convey it."

"We also have a lot of… they're not debates but just like where you split up and you discuss; it's back and forth but it's not trying to win. Some of my classes there's debate and it's like there's a winning team and I think that's kind of weird; most of us are not going to Law School and we're not looking to compete in our logic, you know."

*Evidence of learning—students describe how they **know** they know something*

CLAS interviewees explained how they knew they understood material. Specifically, researchers asked "how did you know you knew the material you learned especially well?" Students listed assessment performance as one indicator of success (5).

"I did really well on all the tests and any, like, the clicker questions, basically, I just got good grades in everything during (the course)."

"I probably say my Calculus class. I've… math has always been pretty easy for me and so… that class, we have a quiz every Friday and I've only not gotten a perfect score on quiz once so I feel like that my homework and the way that I study, that I've gotten to really understand that math and everything so it's nice."

Beyond students' performance in assessments, another indication of learning was described by CLAS interviewees as a feeling of confidence before assessment commenced. Students felt prepared to demonstrate what they knew in courses in which they learned especially well (8).

> *"Well, I guess it's a confidence going …usually I measure what I know when I'm about to go into an exam so it's a confidence in how I feel going to the exam; whether I think I'm well prepared and whether I'm confident in being able to answer any type of questions they ask."*

> *"I felt really comfortable talking to people outside of class about it. So, like, explaining it to a friend or being able to relate it to something I see, you know, around campus and being able to tell someone, 'Hey, this is what's going on.'"*

> *"I think you have a generally better feeling once you know you've done the work that you can do to your ability."*

Another key element of knowing a subject was being able to teach a concept to others (9), including peers in courses, students taking classes for which the undergraduate had a role as a tutor or teaching assistant, and teaching friends about the subjects students learn. An extra benefit of this teaching is that it often helps to solidify the concepts for the teacher as well as the student.

> *"One thing I know very well would be mechanics. We do a lot for Engineering and I know I know it well because when people ask me questions about it, I can explain it to them. I can… when people are studying for it, I can help them; I can answer their questions, and I can take pretty complex problems and think my way through them."*

> *"Well, right now I'm working as a Learning Assistant and I have to take an Education class and I think working on the other side of the, like of the playing field where you're instructing other people and where you have students and you're a student at the same time, helps you to see how you can become a better student."*

> *"Like, 'Oh, yeah, I just learned this cool thing about plants and...' You know, just in general conversation. And also, being able to teach it to people, I think, like in study groups, being able to explain if you have a solid enough understanding to be able to explain it to people. And also, explaining it helps make the understanding more firm."*

In CLAS interviews, students know they understand material in a course when they can apply the knowledge in everyday life (9), as well as apply the knowledge in the same or related courses (8).

> *"Well, I guess one test of knowing something is being able to apply it outside of the classroom or a test. And, I guess, something I think of is, in General Chemistry, there's a rule, Hund's rule, that electrons will fill one orbital at a time before filling up, before doubling up in each orbital, so I remember when I was taking that class, I went to go swimming. And, I saw the swimmers in the lanes that were filling up in the same way that the electrons were. You know, sort of singly and then, doubling up when they had to. So, and I mean, I always remember that and I think it's kind of funny, I guess. But, like, so that's one way. So, being able to apply it outside of class."*

"I'm pretty sure you know it when you do well on the tests but more when you apply that material in later classes; like if you learn Calculus and you use Calculus in all of your other courses. When you just do the math instead of having to think about it; you're like, "Oh, wow. I actually learned something.""

"(I thought) 'I don't like gender studies.' Turns out it's my favorite class ever and I know that I know it well because every day I see something that relates directly to the material. In my other classes, there are constantly references to things that I've already learned in that class this semester. So, I think when you can see the broad thing of what you're learning that means you know it well enough to refer to it."

Learning and grades

One aspect of academic practice that is often contentious across college campuses is the assignment of grades in undergraduate courses. In CLAS interviews, we asked students what they thought about how their grades in course assignments related to the amount of knowledge or skill they gained in a course. Replies varied, from students who felt the two were highly correlated to those who saw grades and learning as two distinct and unrelated ideas. Overall, most students said "it depends"—depends on the type of course, the way that assignments are structured, their motivation to learn specific topics.

In CLAS interviews, unlike in a survey format, we were able to draw out the conditions under which grades were highly correlated, in students' opinions, to what they knew. Throughout, students alluded to and in some cases explained the ways in which they have "gamed the system", or performed strategically in courses to maximize course grades while perhaps not impacting retention of knowledge.

Grades Are NOT Related to Learning

Eleven students felt that grades assigned in CU-Boulder courses were not at all related to what they knew. Reports were mixed regarding which way the grades slant, with some students stating they or students they knew did well in courses they did not understand (9) while others felt they had a better grasp of the subjects than their grades reflected.

"I don't believe that grades are like really like reflect what you learn. Because some people just may not be good test takers and get bad grades on tests, but they'll know a lot more material than someone that got a hundred. Because if like you're doing multiple choice tests, you could in theory get a hundred and not study at all, just by guessing."

"I have always kind of believed that grades were basically just an output of going through the motions. I feel like you can learn so much from a class and never actually do any of the work, and, therefore, never receive a good grade. I feel that there are people who do the work, either they have someone help them or they just kind of again go through the motions, without absorbing or taking in any of the knowledge."

"I hate grades. Because they stress me out. I am always embarrassed to talk to my teachers about grades because I feel like that is not the point in the class. I feel like I am learning, but like there are things that happen, you know? And then your grade gets marked down. Like I want to go into a graduate program, so that matters to me."

"Grades make me anxious. They don't reflect, I feel like, my knowledge of the material. Because there have been classes... Like I told you that I didn't know what was going on, but I got A's in those classes. You know, I feel like I have just learned to work the system and so I get what I want out of it regardless of whether or not I am actually understanding the material."

Grades Are Related to Learning

A portion of CLAS interviewees state that overall grades and learning are positively related (10), while others temper this opinion with conditions. Specifically, they found grades were a fair estimate of knowledge when: a) courses are concept-based (4); b) courses include a variety of assignments (11); or c) students are traditional learners/studiers (3) or know how to "game the system" (7).

Learning & Grades Have a Strong Positive Relationship

"I think (learning and grades) usually go hand in hand. So, I definitely... The classes that I've gotten better grades in have definitely have been the classes that I've learned the most."

"But, yeah, I think there's a strong correlation between learning and grades. I definitely can't ***not*** *learn material; I can't like "wing it", because I have to learn to be able to get grades. So, yeah."*

"I feel like if you know it you can show it; you should be able to get the grade. At the same time… yeah, I think your grade should reflect how well you know it. There's always certain circumstances or people just can't take tests or they get too much pressure on themselves, but I feel like for the most part, even if you don't do so good on the test, if you can do your homework well it should balance it out."

Learning & Grades Have a Positive Relationship- When Courses are Concept-based

"So, I would expect that, you know, for people that really understand a concept or the material, that they'd be able to perform well on exams because that's what they're being tested over."

"That depends entirely on the professor. I've had, this year, people who totally equated them; how much you've learned with what you get. And that includes how much you've learned of what they wanted you to learn and how much you've learned on your own. Like that excellent professor, that's how she is. Like, 'how much do you fully understand the whole idea?'"

"Some of the classes in miscellaneous places that I have taken where it is more memorization of material, I am not sure there is really a high correlation there between grades and learning. It kind of seems as though you can memorize a lot of stuff and do well on the test but typically you forget it unless you are constantly reiterating that in your mind."

Learning & Grades Have a Positive Relationship- With Varied Assignments

"I don't always think that like courses that are solely based on exams... I test well, so I don't care, like I get good grades on my tests, I get good grades in the class. But, I know there are people who like obviously, solidly know their stuff. They know everything and they take a test and they like fall to pieces. So, I don't think it always correlates. Sometimes, it does. I think it depends a lot, like I said, on the course and on the person and I'm just lucky that I test well enough."

"If the class is … like the way the grade is compiled from many different things; homework, tests, quizzes, whatever you may … a very broad spectrum, then yes, I would say that it's a very… especially if it includes a weekly homework thing; it's a pretty good indicator of what the student knows."

"Because if your grade is based on an in-class essay and a final exam and you don't do well under pressure, then you're not going to get a good grade. But, that doesn't mean you're not a good learner. But, if the grading is based on writing and tests and all, like class participation and just like smaller things, I feel like it's a much more accurate representation."

Learning & Grades Have a Positive Relationship-When Students Study/Learn Strategically

"So, I don't think the classes do a very good job … every class has a standardized test not realizing that's an issue for a huge class; there's nothing else to do. I just think it's kind of unfair that people who are hands-on or spoken learners, that aren't the verbal or on paper type, that it kind of points them out. I've know some that aren't that bright that do well on tests just because they're good test takers."

"I think if you cram before a test, you do just homework and you cram before a test, grades are a poor indication. But if you study consistently between tests, grades are a good measure. So, it depends on the way the student has learned. It's actually studying in course. You know, if I go out and party forever and I did this test well, I'm not actually learning, I didn't learn how to put out knowledge. But if I'm actually making an effort consistently throughout the few weeks between tests to actually learn a subject then it's a good barometer."

Student: *I feel most people will study stuff just for the test and they won't actually learn it.*
Interviewer: *Does that mean that they get good grades but they don't learn it, most people?*
Student: *Maybe not everyone, but I feel that is definitely the case sometimes. People are studying for the test and how to take the test and they are not trying to actually absorb the material.*

CLAS interviewees recounted instances where they felt grades or assignments were particularly effective at measuring what they knew. Courses with a variety of number and type of assignments were mentioned (5), as well as course assignments that allow for constructed, or short answer, responses (6), are based on broad concepts of the course (2), and assignments clearly linked to professional behaviors in the career field (7). In some cases, culminating projects were described as a way to integrate many of the listed elements into a quality assignment for student learning. The complexity of assessment and issues of communication difficulties, ambiguity of grading in subjective disciplines, resource limitations particularly in large courses, and students need for accurate, appropriate levels of support in showing their knowledge are clear in the passages excerpted below.

"(I like assessments) where the students are not too constrained, like it's cool to have a design project where you get a lot of… you can be creative and flexible and be innovative but at the same time, make them use all the skills that you've taught them to get it done on their own, I think is probably the ones that have stand out to me."

"I took an Intro to Business class for a business minor over the summer, and he had us do a project where we picked the company and we had to pretty much go over all the different aspects of business, which is like finance, accounting, and marketing, and assess all their numbers and everything they have learned, and it was pretty interesting. We did McDonald's and we learned about how they are doing, how they are succeeding, and everything you kind of understood, like the different aspects in a broad general basis for all of the different parts of the business. I liked that."

"I guess I like the philosophy of one of my classes right now that has different... That grades on different types of activities, so like we took one standard test, very factual, and then, we're writing a paper which is more subjective. And then, we do labs--this is for my Plants and Society class--but, I mean, she said right up front, our professor said right up front that that was to recognize different learning styles and participation and attendance, I think, is part of it, as well. So, I like that philosophy of grading."

"I don't want to say that essays are the best way to go but I think if you have knowledge of something you are able to communicate it better on an essay. It doesn't mean that you are able to... like you think you know something perfectly. I don't think you are ever really able to communicate everything you know in an essay. Whereas, if you know the right answer on a multiple choice you just circle it. That is the right answer. I wish things were more like a math problem where at the end you get four or something like that. Four is the answer. You have to do all of the work to show what you have done to get four. It is hard to show what work you have done in an essay and the final answer. You are just trying to put the answer in there with everything proving that you know it."

Study Strategies

Learning to learn—CLAS interviewees develop studying strategies

A common response to interview questions about studying revealed that students had little cause to study for courses or tests prior to college- in their first semesters at CU Boulder they learned to study through experience, observation, and by heeding and/or soliciting advice from peers, professors, and advisors. This portion of the report describes how students at CU-Boulder complete assignments and prepare for assessment in their courses, specifically the methods they use to study, with whom they usually study, and where they study best.

Students' study processes

Nearly a third of those interviewed said they studied by reading the assigned text (23) and supplemental text (2) carefully. Most said that they always did readings for class, or that they always tried to do readings for class and only 4 mentioned that reading was unnecessary for success in coursework.

Another significant portion of students (17) described discussions with peers as an important aspect of studying. This learning through talk is related to the deep learning students mentioned in courses in which they learned especially well.

> *"What I like doing is, what I've just learned, I like applying it and I like to discuss about it. I find that fun and it enhances the learning experience, I guess. You get to learn and create relationships at the same time."*

> *"I work with other students when we have group projects or review sessions before tests."*

Another positive aspect of course discussion with peers is the feedback students receive in discussion. Students from the CLAS project support the recommendation from AAC&U, that permitting undergraduates to work collaboratively on projects or assignments is beneficial (Kuh, 2008). One student mentioned that working in groups allows you to "see where you stand in relation to your other classmates. Some of it I'm able to discuss well, some of it – oh, I've got to go back and study some more."

As they mentioned in discussing deep learning experiences, students stated that homework and practice of procedures (via old tests, online quizzes, and supplemental course practice problems) was a major method for studying coursework (27).

> *"Homework, studying, going over old problem sets and old homework, old tests. Because, especially like... It just helps, especially if it's like a vertical learning course. And, just going back for like little pieces of the puzzle."*

> *"I go to the library, I do my homework. I try and do all the readings."*

> *"Homework. Homework for me is a big way to get understanding. Text book reading for the classes that have it. But primarily, I think if the professor is good, the homework that they assign, if you can do the homework typically, you will have at least a decent understanding of the overall class. You know, so that is your way of kind of working through different aspects of it. By the end, you can do all of these different types of homework problems, well now you can do basically the class."*

CU-Boulder students involved with the class project also listed seeking help as a way in which they study course material (7). Most often this help came from TAs, specific tutors, professors, or help labs in the math and science subjects. Students also develop specialized systems for studying, including the use of flashcards, note cards, and professor-provided notes (7), visual aids such as concept maps, repeated transcription of course notes, while a few admitted to typically cramming for tests (8).

> *"Definitely just note taking, reading the book; I make note cards once it gets closer to test time."*

> *"I would make review sheets before my exams because I learn best by writing, not by listening to things."*

> *"I use computer generated flash cards."*

"I make sure that I read the book, and then I like doing the practice tests for different classes if they offer them. Because I think, at least, they were like previous tests, so that is really helpful. And then, like you can see what you got wrong and like learn that way, like from your mistakes. And like I usually go over notes and stuff like that."

Studying alone or studying together determined by student preparation, learning styles

A portion of CU-Boulder interviewees state they only learn when studying by themselves (30). For others, studying in groups is preferred, whether they are studying in parallel (students working on different course material) or studying the same course together (17). Even students who prefer to work along during the semester often partner with their peers to prepare for assessments, such as group work, tests, and large homework assignments (21). Students say that it is best when each member of the group prepares for a test before meeting in a group, and each person comes with specific questions to discuss with the group.

"I seem to function better, I guess, studying alone. Part of the problems I had before, you know, I guess this can just go towards informational… When I was involved in groups as an undergrad, like I said, there was homework, homework, cram. And so, when I would get together with groups the thing that kept screaming in the back of my mind is, "Why am I with these people. I've got to go study."

"It really depends on how much time to have left to get it done, and where my level of understanding is. If I can do it all myself, I typically will do it all myself. If I have a lot of questions or issues, then I will work with someone else, so that we can get our questions figured out."

"When I do (study with other people), a lot of people are test-phobic, sit down, just have a study session where we'll say, 'Well, this...' Just like kind of go over the concepts and just kind of quiz each other."

Studying environments parallel learning styles- quiet versus interactive

CLAS interviewees' favored learning environments matched their study strategies in most cases—those who studied alone chose to work in quiet places, such as Norlin library (13), and their dorm rooms or apartments (13). Those who preferred to study with others often chose libraries with group study areas, such as the business and law libraries, the earth science library (5), and coffee shops (10), as well as the UMC (2) where they were more able to talk with their peers. Some students also said they tried to complete their studies on campus, before they returned home for the day (5).

Developing Study Strategies

Nearly all students said that they are better learners now than they were a few years ago. CLAS interviews probed to discover who or what assisted students in developing superior study and learning habits of mind. Students' responses fell into three categories. Undergraduates stated that: a) campus resources (e.g. faculty, staff, and programs), b) their peers, and c) their self-directed activities for personal development led to their improving capability to learn. The

resource Navigating the Research University: A Guide for First Year Students (Andreatta, 2006) was recommended by CLAS stakeholders as a guide for developing study strategies.

Campus Resources- Professors and TAs

Students state that professors aided their development of study strategies and skills in three ways—through one-on-one assistance in office hours (14), tips or hints delivered in lecture (5), and through structuring courses to foster independence (3). Teaching assistants aided students in office hours, particularly because they were able to provide an alternative perspective from that of the professor (9).

> *"I don't go to most of my classes and I think if I did go I'd feel less stress around exam time and I'd understand the material a lot better. So, I should go but I don't. Yeah, I go to office hours before tests a lot just to shore up my understanding of … you know, I'll do an example problem or a problem, I won't know how to complete it, and so I'll go into office hours and discuss it with my, either my professor I've gone to and my TA I've gone to, as well."*

> *"Definitely TA office hours (have helped me learn). There was one course that I was in there all the time. And, it definitely saved my grade and my understanding just was improved phenomenally by going to TA office hours. That's probably the main one, though."*

> *"I think professors that just let go of the reins a little bit (help me learn). Like, I said independent study projects. So, professors that sort of open up those doors, I suppose, would be responsible for developing that kind of learning. So, in the honors classes, I think, especially have and my Plants and Society have been more open to those types of projects."*

> *"Just the professors themselves (help me learn), the tips that they'll give in a lot of classes on how to study for their class and then for other classes like it."*

Campus Resources-Programs and Services

CLAS students mention that staff assisted them in their learning, particularly advisors (2), and tutors (5), as well as going to writing labs (2) and study help rooms such as provided by math and physics departments (10). Undergraduate research, a high-impact educational practice, according to the American Association of Colleges & Universities (Kuh, 2008) was mentioned as opportunities also aided students' learning (2). In some cases students express regret for discontinuing their participation with help labs.

> *"I did Physics 1 through 3 and all of them, they had the help room there. That was very helpful because, not only…the professors would be there so it was kind of like office hours but everybody is working on the problems at the same time, too. The professors, when they would come by to help you, they wouldn't just tell you the answer or… it was kind of like what you were saying, getting people to interact, too. They would be like, 'I just talked to him about it. Why don't you explain it to him and see, then if you don't get I'll try to reiterate it.' That's also just because there's a bunch of students and just two of them, so getting the students to explain things to each other, help each other out, time management wise helps."*

"Like, some of the tutors that I had last year for chemistry were so helpful and just like even, just like on strategy for how to... For all my courses, just like how to study in general. And even, like, in this--I'm taking Calculus right now--and the math... Like, they have a math help room and all of the tutors there are awesome and they'll just definitely like walk you through everything. And, they teach you how to just even like take a test. Like, look at the test and not freak out and go through the steps and figure out that you do know what you're doing."

"Yeah, there are a couple that I think I should have gone to. I rarely go to teacher's office hours, TA's office hours. The economics building has pre-help lab pretty much, I think it is two hours Monday-Thursday that I could go to. Sometimes I am doing my homework and choose not to, and I don't understand my homework, so I just turn in the some BS paper and I get 50% on it. I did tutoring in the dorms when I was a freshman for an astronomy class. I went for a couple of days and then decided not to do it anymore. I ended up getting a B, which wasn't too bad."

Peers Improve Learning

Students' learning and studying improve with interaction with their peers, through assistance from peers who serve as mentors (14) and from peers who study with the CLAS undergraduates (11). This finding substantiates the notion that peer learning communities may support student learning by connecting students' social lives with their academic lives (Tinto, 1997). Sometimes students were not studying for the same course, but built motivation to study when they were around other studying students.

"There's my friend from high school; he's really smart so I go to him and I find that I learn more discussing topics with him."

"There was a project, basically an extracurricular project (in engineering). That was with a group of some like senior design people and some just other, sort of students. And so that time help came from students ahead of me, and graduate TA's."

"I live with my boyfriend so he's also pretty studious so it helps to have somebody at home studying when I should be studying."

"I guess maybe I've had a couple of friends in classes and that kind of like works on accountability a little bit and we make sure that the other one isn't skipping class or the other one is doing the work for it. And then, we get together and study and it kind of forces to do so. Just having someone else in there, kind of want to do your best because they're your friend, you don't want to look like an idiot or anything."

Students found that their own quest for doing well in school often drove their improvements in learning. Specifically, they found trial and error and experience led to improved study skills (37), as did their cognitive development in their late teens and early twenties (5). A few mentioned developing the discipline to study (4). Most reiterated that college was where they learned to study, because they did not need to study in high school.

"Well, I've kind of worked on some studying skills that would work for me, learning matters a little bit more to me. I've found something I'm interested in that I can study and that it's just up to me, like, I want to study and, like, this is easier for me to set aside some time which, I guess, two years ago, the senior year of high school, it didn't really happen."

"Our minds are always growing and so I understand concepts faster than I did back in like my freshman year in high school because college is more accelerated and we have to adapt to that; to catch up and follow the material."

"I think a lot of the learning process--and, my engagement with learning is one where fine distinctions and subtleties are important. And, I didn't quite have that. I had kind of moved to develop that skill earlier on, but I hadn't really acquired it or fine-grained it or fine-tuned it until I had some to college and taken the courses that I have, it's been able to develop a little bit better."

"I think it was mostly experience. I have been here for four years now and you pick things up over time. It wasn't really like here is a list of things that you can do to be successful on tests. And really I have heard those lists before and you can take I guess some things from them, but really it just doesn't work for me."

"I mean I had a pretty easy time in high school, so like once I got something I stopped paying attention. And like things are a little more difficult in college, so I think that helps like when you are challenged that it is easier to learn things when you have to think about them, instead of just passively like getting it."

Semester courses

For the 2008 CLAS interviews, students described their fall semester course choices. The interviews took place primarily in late October and November, and so students had experienced over 6 weeks of the courses before discussing the semester with CLAS researchers. Many students chose courses strictly to fulfill specific core and major requirements at CU Boulder.

"Right now I'm just taking courses that I have to because I need to deal with Sociology and Elementary Education…So, I have this huge spreadsheet of all the classes I have to take and it was pretty much just take what you need to, but I like the classes I'm taking."

"I pretty much came in with a plan like, 'These are what I need to get done this year,' so I'm just finishing off which ones I need to do. Honestly, Japanese, I have to do them both for each year and then I'm doing the b-core classes for my Master's program; so I just have to get those. Then upper division credit left."

"Well, this semester, basically I haven't taken any electives. I have chosen the courses because they are required for my major. So, I would say that you know from the experience of the courses I am taking right now, it has been sort of a difficult semester."

While graduation requirement was a primary motivator for most of our interviewees' course choices (38), students also chose courses for which they had specialized professional interest (4), or which they felt would prepare them particularly well for their intended careers (9).

"The courses I chose this semester…there were two required but with my Fluids course I got petitioned to take another one. Most of the courses that I'm in right now, other than the required one, are in some way related to climate change or renewable energy, something like that because that's what I'm interested in (pursuing for a career)."

"I took one elective credit, or three but one class, just because it relates to what I'm working on in the (science research) lab. I don't really have much biology/ecology experience…"

"I'm taking Plasma Physics as an audit class. I think that just helps me with Astronomy; you get into all the plasma. I'm taking a math class that fulfills a requirement in that it's Differential Geometry and I was thinking that it would apply to Cosmology because, yeah, the universe can have different curvatures."

Students used coursework to nourish general interests (27). Diversity in types of courses was preferred by a subgroup of students (13)—they sought out variety in thinking to motivate themselves in academics. Students developed strategies for choosing courses for general interest, including monitoring professors' rated FCQs (faculty course questionnaires), receiving advice from peers, and noting course enrollment size to determine if the course was of interest.

"I looked at the courses that fulfilled those requirements and mostly... Well, I guess I chose it a lot on the title of the class and then, also on the quality or the FCQs of the professors. ... I'm getting to take a lot of electives, too, so those... Like, class size and the types of experiences that I thought I had had and also recommendations from people. Like, the Clinical Research class was recommended to me by the pre-health advisor. Also, I've wanted to take a plants class for a long time and I was just really interested in that, so I looked at the plant classes and saw which ones looked most interesting and read their descriptions."

"It would be a shame to have all of your hard classes one semester and then all of your easy classes one semester. Why not balance them out more? It is just again so you can concentrate harder on your hard classes. You will know typically which ones are going to be the hard ones based on what kids say about them and how did they did on the test and stuff like that. You don't want to load those up."

"I used to always have art in my life and then I stopped having art in my life and it didn't really get to me until just now. I was like, 'I have to do something physical with my hands…Ok. Writing, literature, and sculpture; I've got to stay sane.'"

Some students described a constrained choice, in which they selected specific courses among three or four options for satisfying their majors, while others lamented that their chosen major allowed for little variability in schedule. Logistical constraints that hampered student choice were busy work, study, and class schedules that forced students to take courses that fit within their free time, as well as specific schedule times that work best for student studying habits (4). For underclassmen, the popularity of some courses over others narrowed the list of classes in which they were able to enroll (4).

"It is just like 8, 9, 10, 11 and you are done for the day. That is a nice little block which is a great feeling because you know you only have to get up once. You can eat after that and you have a nice period later in the afternoon to do homework and then you are free for the night."

"Well, when I came for orientation I was in one of the last groups, I guess, before they opened up more seats in classes. So, there was nothing available. I pretty much am taking the classes that I'm taking now because there was nothing else to take. But it seems to be working out pretty good."

Many students (20) describe a strict adherence to graduation course recommendations laid out in major course schedules. They feel these sheets make detailed advice from peers, professors, and advisors less necessary. This practice ensures they don't fall behind in their majors and follow

the sequence, particularly in majors like natural and applied sciences for which sequence is viewed as particularly important.

> *"Well, definitely; I mean, from my Integrated Physiology advisor, just the whole… they give the semester by semester layout for what you should be doing. And that definitely helped because then I just looked at that and said, 'Ok, here's what I want to take' and just sort of filled in my electives from there."*

> *"The rest of them (semester courses) were all chosen for me. Kind of; I mean they're outlined for the best way to get through the major in four years and they're pretty much required to go on to next courses. So, 3 of them I had to take. And then there was 1 other course that's an elective and, for Engineers, you have a Humanities elective every semester."*

> *"I just looked up the courses that I had to take to fulfill my major and I took them."*

CLAS interviewees found academic advisors as well as faculty helpful in consulting about courses to take, recommending timing for courses, and ensuring that students had well-balanced schedules (27). Peers are also consulted regarding semester course decisions (11)

> *"I go to my advisor and we just talk about what I should be taking. And, right now, it was just making sure that we got like some of the core classes kind of* ***(unintelligible)*** *and then, the maths, those courses are too. Just to make sure I'm getting what I should be getting, so I'm on-track with majors."*

> *"From my advisor. She definitely was kind of instrumental in saying, 'Well you need to fulfill this requirement. Here are these courses. In the past, you've liked this and this; you might like this one as well.'"*

> *"You definitely talk to other people (when scheduling classes)."*

Course cohesiveness

CLAS interviewers asked participants about the ways in which their courses fit together from semester to semester. Some students described the nature of knowledge building from one semester to the next within a discipline (17), and mentioned this was particularly true for math and science disciplines (14). These responses indicate students have opportunities at CU-Boulder to frame learning holistically, as building from past knowledge rather than occurring in isolated courses (Barr & Tagg, 1995).

> *"I would say like taking the history classes that I have taken, they kind of like give you like a broader understanding of like...a lot of them were like specialized in certain areas and you had a general outlook of what was going on during that time period, like throughout the whole world."*

> *"Some classes, they just naturally build on each other, like all the sciences, all the maths, they just build on each other."*

> *"I started out with a 1000 level principals of micro and macro economics. I started with a business calculus class and you can just see how that it kinds of starts real broad and*

you don't really use too much things that you learned before, you kind of learn from the beginning. Then the next class, like you learn some calculus that you learned before and you throw in some, like they assume you already knew some things, and they make it a little more complicated and it gets a little bit faster paced, but as long as you kept up and remembered the things."

A smaller group of students stated that these connections extend beyond one discipline into related disciplines (8), or across many disciplines (5) which they found particularly helpful when courses they took in a single semester overlapped in terms of content covered or ideas discussed.

"Well, I guess the languages are definitely cumulative and build on each other. And, Latin, we'll kind of like talk about things that kind of mix in with my Roman history class. And then, in Greek, we'll kind of talk about things that mix in with my Greek history class. And, I'm taking physical anthropology this year and some things we've gone over there have kind of like worked in with my archaeology class from last year. So, a lot of the things like within the same department kind of go back and reflect on each other or overlap a little bit and it kind of helps to reinforce the material a little bit, I guess."

"I love that actually this semester because I'm taking basic Biology and then a Nutrition class and Biological Psych. So they all three… they really work on the same concepts but in different perspectives, which I absolutely love because I just go to one class and it reaffirms what I learned in the last class but in a different scenario. It's actually a really good study method because you just hear the repetition over and over again."

"Yeah, I think... I'm always really interested to see every semester when... Like, I'm learning the same thing in three different classes all at one time. I think it's really interesting and it kind of makes me excited to know that like what I'm learning in one class is actually relevant and it's true because then, I'm learning it again in another class. And, it's helpful when that happens because then you can kind of combine all the information together."

Another positive aspect of course comparison and cohesion is the way in which courses provide windows into professional ways of thinking in a discipline. According to a handful of CLAS participants (5), the opportunity to compare professional ways of thinking is beneficial to their learning and their professional development (5).

"I'm taking both Sociology and Psychology and it's interesting to see how different the perspectives are of Psychologists and Sociologists. By comparing them it's a powerful thing to know in which, I guess you'd call it a lens or what not; you can see by reading some material you can see how clearly their bias toward their perspective. We, as students, we can look at both their perspectives and we can say, 'Alright, you know.' We can analyze it; it comes out as a powerful tool later when we can choose and we can identify what perspectives and why we're choosing it that way."

"It's interesting how the linguistics classes build on SLHS classes, but kind of through a different lens; through a more theoretical (lens)…so that was cool. Drove me crazy but it was cool."

"I thought that I really learned a lot because I learned about different process of thinking by Danish philosophers. That was just really helpful because it kind of gives me different views on things that you are looking at, which could then later relate to math or something like that."

Also, a few CLAS participants discovered that elements of skills and knowledge developed in courses often transferred across disciplines—specifically writing skills (2) and metacognitive knowledge and skills (2).

> *"In one of my Astronomy classes we ended up writing a couple of research papers; you just read other articles and summarize it. So, I feel that that has developed into its own writing style for Physics and the writing class I'm in now is like writing in science and society. It's a lot of the same stuff that I've done with Astronomy."*

> *"But, any class that had anything to do with writing …they had a lot in common as far as what's generally expected; like a writing style or the composition of a paper."*

> *"I think the most important thing is you learn how to learn. Like, when you first get to college, like, you still... You have a clue because you've been in school all your life. But, there are some things like when you take... I think, I guess when you take your first really hard courses, like the ones that are going to kill you and like it's really, really difficult to get a good grade, you really learn how much effort you have to put into it. Because I wouldn't say you can take like a biology course and it somehow leads into a history course, you know? Or, you can't build off of one to the other. But, if you're taking a really, really hard bio course and then a really, really hard history course, you remember like how you studied and what you did to get the good grade."*

Courses Relate to Life

Relating College learning to other aspects of students' lives

CLAS students described multiple ways in which what they learn in CU Boulder courses relate to their lives outside of the college classroom, though not all students perceived these connections. Students further along in their programs and students who were post-baccalaureate students pursuing new degrees were on average more likely both to make connections between their interests and their courses, and to see how their courses related to their future careers.

Nearly half of the students in the CLAS study mentioned that information they learn in their courses at CU Boulder will help them in the future (30). In some cases these statements were made broadly with few examples of how the information might be relevant. It is unclear whether each of the students had thought about specific uses of knowledge in their future lives outside of school.

> *"It's all stuff that I know that I'll need in the future, so I know that... I know that it's stuff that I want to learn and need to know and will be important and it's vertical learning. Like, you learn the small, little stuff now and then, as you get into the really upper division classes, you need to remember the stuff from then. And then, when you get into grad school, you need to remember stuff from your upper division courses and that type of a thing."*

> *"For my career, International Business, I'll probably be traveling and, obviously, having to speak Japanese so it's really important to me right now to learn as much as I can so I don't have to catch up as much later."*

"Yeah, definitely. For Economics and being a Business major and Business Calculus, kind of working with revenue function and things like that, I could see that's relating to my future degree and stuff like that."

"Yeah; I think a lot of the times, getting a job, you need to have some kind of experience. So, like some of these projects, we have a senior project this semester, so it's this semester and next semester for Computer Science, and it's kind of like a bigger task so it kind of gives the idea of what the work place is going to be like and kind of the size of some projects in the real world. I think that's important to know what you're going into. A lot of times they want to know some specific projects that you've worked on so it also helps give you some experience that you can relate to in an interview or whatever."

Interview data suggests that students also can envision how the skills, knowledge, and ways of thinking they develop in courses are necessary in their desired career fields. Perfecting and refining this knowledge as college students were deemed important in their development for this reason (22). Students find ways to make connections to what they will need to do in future careers, see themselves as taking on professional, discipline-specific ways of thinking.

"The main way that I guess my courses relate to my life is … I feel like especially this past year and so, is preparing me for a career; it's where I'm looking to go, in May, is to go off into industry. So, I feel like the courses now are honing in all the skills and tying things together and, yeah, just making sure I'm competitive out in the market, which I feel that I am."

"A lot of what I realized just in the last two years or so, is just engineering in general and the way that I view the world compared to with how non-engineers tend to view the world, very different. That is becoming more apparent to me. I think part of that comes from schooling. You know, it is very much about the very scientific way of looking at the world, to try and make things as black and white as you can, even though you can't always do it. You know, it is very much of understanding the cause and seeing the effects, and that plays out on how I see life in general I think. I have a very logical approach to life."

"It kind of prepares me for a job. Like, I'm working for an accounting firm starting in September, so I kind of try and relate what I learned to a job and try and think about how that could help me there. And, ways that I could use that knowledge at work."

For some, courses related directly to students' passions and interests—they feel their major courses provide a venue for them to ***explore*** these passions and interests (21). In some cases, the knowledge developed in a course led to increased interest in a subject.

*"And, the courses that feed into passions or something that I want to do in the future, like the writing part, those obviously, **I don't consider those a class.** I more consider them as a workshop to help me with skills that I will one day, hopefully use."*

"You have all sorts of cool conversations you can have because you know more information because of the classes that you took. I think to some extent some of the classes having impacted what type of interests I have overall or types of things I might be interested in on my own or what sort of things that I might read or watch."

"Like watching my dad work on the car – actually got pretty technical on you know weighing the car and changing just the little things on it. So, here soon, I'll be able to

understand what he's doing exactly. Actually, might even more than him. I think he just got it from experience."

"I hope to someday work in either Environmental Studies or the geology field. I'm pretty passionate about the outdoors and I like mountains a lot. So, I don't know; it's just, I like to be outside and be able to apply what you know."

"Well, oh, well, the reason I want to go to med school is because, eventually, I want to help... I want to be like a pediatric endocrinologist of some sort that like helps kids with diabetes. And, I'm Type 1, too, so it's kind of like that interests me because it's like I kind of want to do research on the side because I'm curious about it and that's kind of how it all got started. And so, I guess right now, my biology course is just kind of like working towards that and I can kind of connect some of the stuff to like the treatment stuff I have to do in my life and so, it's interesting to me."

Unwritten Rules for Success

"Do your homework." "Go to class." "Don't party too much." While the advice may sound familiar to any entering college freshman, these pearls of wisdom came directly from the mouths of current undergraduates at CU-Boulder. Students realized that many of their suggestions were in fact written, or often quoted to students. In CLAS interviews, participants not only pontificated about how to succeed in college, they backed up their statements with personal experiences, proving they know of what they speak, and can explain not only ***what*** to do as undergraduates but ***why*** those actions led to their intellectual or personal development. The majority of responses fell into three wide-ranging categories: ***academic engagement, life skill development,*** and ***broader engagement in the community***. Student responses are described in detail in Appendix A of this report.

Continuing the Conversation

The Colorado Learning Analysis Study is designed to be cyclical, to build on prior years' responses and on CLAS Stakeholders' expressed concerns to discern how students learn best at the University of Colorado at Boulder, find what motivates them to engage (or not engage) meaningfully in campus life and academics, and discover how they feel their courses prepare them for their futures. Recommendations for students and for faculty based on the concepts revealed in this study are presented as Appendices A and B of this report.

Like most research, this project raised as many questions as it answered. A few topics for future research include:

Students mention a self-reflective, trial and error approach to learning to study, which in some cases takes multiple semesters to perfect. How might they be assisted in developing metacognitive skills and knowledge earlier? How could faculty and staff support this?

CLAS interviewees mention a vague, though positive response to learning from diverse students and faculty. What sorts of experiences could enhance students' understandings and appreciations of diversity in its many forms?

Students describe myriad ways in which technology enhances or substitutes for text book learning and lecture material. How can they be supported in finding reliable, complimentary material online? How can professors support this new way of learning?

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Appendix A:

Unwritten Rules for Student Success

"Do your homework." "Go to class." "Don't party too much." While the advice may sound familiar to any entering college freshman, these pearls of wisdom came directly from the mouths of current undergraduates at CU-Boulder. Students realized that many of their suggestions were in fact written, or often quoted to students. In CLAS interviews, participants not only pontificated about how to succeed in college, they backed up their statements with personal experiences, proving they know of what they speak, and can explain not only ***what*** to do as undergraduates but ***why*** those actions led to their intellectual or personal development. The majority of responses fell into three wide-ranging categories: ***academic engagement, life skill development,*** and ***broader engagement in the community***.

Engaging Actively in Academics

Students would tell future students that they really needed to go to class (10) and participate fully (8) when they do attend. Going to recitations is particularly effective in learning at the early stages of college where courses tend to be large, according to CLAS participants (1), particularly because they provide a venue for learning from peers (5), and meeting peers with whom a student could study (1). Students described the benefits of receiving help from professors and TAs (12) when they were not doing well in courses. One student mentioned that pursuing teaching opportunities allows students to learn, as to teach something requires a deep understanding of the material. The quotes below were chosen to illustrate the reasoning and personal experiences grounding students' recommendations for success.

> *"I would say, 'Don't skip class. You can learn a lot just by going, even if it's at a time you don't like or the class itself isn't very interesting.' And I know that's like a technical rule of school but I think it's important in a lot of people, especially in their freshman year don't go to their classes when they could do a lot better just by showing up."*
>
> *"Just, you have to take advantage of different study groups and things. That's something I didn't do before my first test and didn't do well; then sort of got on that boat for the second one and did a lot better."*
>
> *"I think it's a good idea to, for students, to build relationships with people in their classes and their teachers and advisors because it's nice to have other people to relate to what you're doing. And, I joined a business fraternity a couple years ago and that just helped me in so many ways. It was... To be able to talk about class with someone else and like exchange ideas and stuff because some people might not know people in their classes. And, it's really helpful when you do have those relationships."*
>
> *"Get to know your TAs, actually, because if they know you, you can learn more from them and they can be more willing to help you. It's probably the same way for the professor; actually, maybe more so. I never did that so I don't really know, but I'd say get to know some of them."*
>
> *"Professors always say, 'Come see me at my office hours,' on the first day and nobody ever does. I think that that's a really big thing because if they know your name and they*

know who you are, the chances of you doing better in the class will be better because you feel like you know them so you're able to ask questions when you need to and speak up in class when you need to. They'll be more likely to give you a better grade because of participation; they're like, 'Oh, yeah. I know this person. They came and saw me. They participate.' I've had a lot of classes where I've been on a border between two grades and they bumped me up because they know who I am; because I went and talked to them; or they give me an extra credit opportunity because they know who I am."

"Unwritten rules for success are – office hours are there for a reason; that is huge, I learned freshman year. I had taken Calculus in high school and I came into Calculus 1 and I'm like, 'Oh, I've done Calculus before,' and all that. I bombed my first test and then my professor, he's like, 'Oh, anybody who got lower than this score, I'd like you to come talk with me.' So, I went and talked with him; he's a really approachable guy and his office hours were really helpful. I was a regular go-er there and then I aced the course."

Study Continuously During the Semester

CU-Boulder CLAS participants have been there—it's 10pm, you have a huge test in the morning, and you haven't cracked a book. They encourage incoming students to spread out the work so you don't *have* to cram (11), and you may also feel more confident in facing exams. They mention that doing your homework (9) and keeping up with readings makes test-taking less anxiety-producing. CLAS students say whether a student heeds this advice or not, the college experience itself teaches undergraduates how to learn (5). For more advice regarding study strategies, CLAS stakeholders recommend the resource Navigating the Research University: A Guide for First Year Students (Andreatta, 2006) as well as "How to Succeed in College: Learn How to Learn" (Bjork, 2001), detailed in the references page of this report.

"Yeah; homework as well. I think they help so much and when it comes time for a test, you just look through your homework and be like, 'Ok, I got this, I got this and I missed this one; I'll review that question.' I can get away with studying an hour or two and other people are studying for five hours and I think that's just the homework. You invest the time into that and then when it comes time for the test, you don't have to worry as much."

"Make sure you study, give three days before the tests and start studying. I know I felt like I studied the day before and I would like get the basic general outline out, and that is the hardest part, once you get that out you can just kind of go over it and memorize it, and I couldn't get the go over and memorize it part because I don't have enough time. Just kind of study in advance three days before the test."

"You know, make sure you put enough time towards classes...and do your homework. That's a big one…There are two reasons, one is a grade and two that is how, at least for me, I'm learning the material for the class. Not only if I don't do my homework I don't get the grade on the homework, I am also going to fail the test."

"Then also like it helps too to every so often instead of like waiting until your test to look over your notes, like every couple of days just looking back over your notes, because then like when it comes to your test, you don't have to study as hard. You have read it so many times that it, you know, it sticks better."

"I… through high school I never really studied and I thought most of my freshman year, well into my fall semester and probably some of my spring semester, I didn't study. I did pretty good but then toward the end of spring semester, definitely this year, I found that

you've got to study. It's required. And you've got to do a lot of reading, which is pretty much part of studying. That's the single biggest thing I guess I would say."

A large part of the college experience, according to CLAS participants, is learning how to live independently. They mention life skills they are developing that they attribute to their college careers and experiences, and would urge new freshman to focus on personal development as well as academic and intellectual development while on campus. Specifically, students mentioned developing a sense of school/work-life balance (14) and time management skills (6). The quotes below represent differing student perspectives regarding balancing school work and social life.

"Try to set aside some time just to kind of have fun, relax, so you're not like all stressed out. Hang out with friends and go to a party or something. And, don't let it interfere with what you're studying. Don't do it too much, but it's just like, you need a little bit of time to kind of let your brain rest and have fun, so it's not just a completely stressful situation because then you're not going to do well in your classes and then you're not going to learn as much socially which is another big, important part of college. And, you just have to kind of balance both of them well."

"You know, try not to go out too much, drink too much, you definitely have to find the right balance between partying and going to class and getting your work done. I think that's the biggest, most important thing for incoming freshmen to have to deal with."

"I have been on both sides of it. When I first came into college I was on the other. I would rather socialize and school came second. Now I am on the other side of that. Definitely my advice would be to focus on your education. It may seem like the end of the world if you do not go to a party but it is so important for everybody involved, for the people paying for it, for your future, for your family, to just get this done and focus and get the most out of it."

"I think a lot of students don't take college seriously enough. I know even a lot of my friends almost dropped out because they kind of partied, they lazed around, they didn't go to class, they didn't do homework, and then they go to the end of the semester and had a C minus or Ds and are on academic probation."

"There are too many distractions at CU, which is good obviously because you have to know how to manage your time like we talked about, but there are too many. You have to accept that there are things that you cannot do. Whether that is going to a party in the middle of the week, you know you just have to eliminate that. You can't all work hard all week and then just blow it on a Thursday night. It is too tough to manage. Use your weekend wisely."

"I think what was hardest for me when I first started was kind of being on your own in the what was due when and when tests were and stuff. And, it really helped to just organize your time and organize, you know, put all your syllabi together and look at all of them. And, I think it's just really important to know that it's up to you individually to study and to organize kind of what you're doing."

In CLAS interviews, research participants advised new students to take advantage of all that the University of Colorado at Boulder and surrounding community has to offer—from campus resources (2) like the library(2), tutors (3), special events and clubs (6), and local community resources (5).

"I am a big outdoor enthusiast, so I mean the fact that we are so close to that... I mean like I can hike from my dorm into the forest like... that is so cool. And there is just so much stuff, there is so much you can do. Try and like tackle it, don't like stay in the dorms."

"I guess it's just one of the major like advantages, I guess, of going to a large university. Like, you might have big classes and stuff, but also you have a lot more opportunities whether it be clubs or what not. And, I think that just helps in kind of broadening your horizons and learning about yourself and others."

"Since (the school) is so huge, there are so many opportunities that you can do; I'm just now figuring that out. You can get an education unlike anything you can get a private school if you just take advantage of what's available here; you could study anything at this college, which is so great about it. So, yeah; take advantage."

"Take advantage of what's there to you. Like, you know, the math help lab is a great resource. Office hours are a great resource. There are so many resources on campus. If you don't understand something, there are like eight or nine libraries on campus, all of them have books."

"If you're struggling even with your first test, get a tutor, get help. Like go to see your advisor because like you can fall behind really quickly."

"It's like there's so many people here and different things going on and chances to socialize and meet new people, so go do it. Especially for me, almost at the end of my experience here, you're only here for a couple of years of your life so make the most of it. If you want to learn how to snowboard then …especially being on a big campus like this and the rec center and stuff; if you want to learn something new that you haven't learned before, then go do it."

Ultimately, CU Boulder is a large university which can seem impersonal if a student is not actively creating a place for him or herself. According to interview data, an education at a vast institution like CU means you "get out what you put into it" (4).

"(On a website about CU Boulder) one girl was like, 'At CU, you get out what you put in.' And I was like, 'Oh my god; that is just the truest statement about this school.' I've never really seen a school like this … I've seen state schools and you either do well or you don't and that's kind of the way it is; there's the good kids and the bad kids and they get divided and go through. Here it's like, you can do just as well as you want; any spectrum that you want. You can learn as much as you want; there are infinite resources and no one is requiring you to take advantage of them."

"What you put into a class is definitely what you're going to get out of it. If you don't go to class or if you don't care enough to listen, then you're not going to learn anything. And, there's a lot more than just your grade, because you can of course have really good grades and then not be able to perform at your job; that's not going to help you at all."

"If you're just here to, you know, squeak by and get a degree, then you know, you can go out, party, do whatever you want. If you're actually here to like learn and like you were saying, more than just grades, then actually put yourself into the class and devote time outside of it to learn the material and not only gain a good grade, but knowledge for future reference and just to be a better, more rounded individual."

Appendix B:

Messages for Faculty

- ***Let students know where to find accurate, supplemental online material.*** CLAS students use technology resources to complement, supplement, or replace their texts and course materials. Guiding them to appropriate, accurate materials online is vital to their intellectual development.

- ***Consider electronic communication as the "new office hours".*** Email is CLAS students' primary mode of communication with TAs and professors- it breaks down some comfort barriers in addressing experts about content students may not fully grasp. Ensuring these online communications are productive and not burdensome or repetitive to faculty and TAs is important in the digital age.

- ***Promote diverse one-on-one interactions among students, with students who think differently from themselves.*** Students interviewed in the CLAS study view diversity in multiple ways, though most see diversity as referring not to them, but to other groups of students (international students, students from other majors, students from other disciplines) and view diversity as an out-of-course time element of campus life. They feel one-on-one interactions with people unlike themselves are the best ways to benefit from diversity (e.g. dorm experiences, events on campus) while a few mention small course discussion as a venue for exploring diversity.

- ***Engage with students inside and outside of class.*** Besides coursework, CU students are engaged in multiple activities during their undergraduate years: internships, jobs, social activities, clubs, and events, maintaining and building social relationships, developing career-related skills, networks, and experiences, volunteerism, and various physical activities that take advantage of the Boulder region. In these myriad activities, they have few opportunities to engage with faculty, staff, and adult (non-student) community members, save for work experiences and courses with professors and TAs. Is there something you could do to engage with students outside of course time?

- ***Vary assessment in courses to get a better understanding of student knowledge.*** Grades in courses are regarded as good measures of learning in a course when assessments occur regularly throughout the course, are varied, and contain some constructed response opportunities, such as essays, short answer items, or one-minute papers collected during class.

- ***Let students know the purpose of and importance of assignments, and how they relate to your subject matter beyond the classroom.*** Students describe their decisions to participate and NOT participate in course activities and assignments as strategic, not strictly a lack of commitment, motivation or interest in a course. Students describe ways in which they prioritize reading, attending class, homework, and test studying according to their own learning styles and to perceived values of instructors. Explaining the

importance and purpose of assignments clearly to students may help them make good choices.

- ***Share studying and learning tips with students—they value your expertise.*** For many, college is the first opportunity for students to learn how to study. While they describe their learning about learning through trial and error, they also appreciate faculty tips on studying, and learn how to study from their peers as well.

- ***To strengthen and deepen their knowledge, describe to students how your field and research area relate to other fields*** Students appreciate interdisciplinary references in courses. When they can make connections across semesters and across disciplines, they describe feelings of empowerment and deeper understanding.

- ***Constantly answer students' unvoiced questions, like "So what?" and "How will this help me in the future?"*** Students do not always understand how the skills and knowledge they learned in specific courses would prepare them for their future endeavors. Connecting content to real-life applications and real-world events helps cultivate student interest and motivation in the classroom.

- ***Even in large classes, build in time for students to connect, to teach one another, and to reflect on what they are learning.*** Students "know they know" a subject when they are confident entering an assessment, receive good grades, can teach the subject to others, and when they can apply the knowledge in other ways to related courses and to daily life experiences. Having opportunities to try out their knowledge on peers supports students in taking risks and receiving feedback. For instance, faculty might pose a question to students, and then provide a few minutes for them to discuss the topic with someone sitting nearby. Faculty might also assign occasional homework to be completed by groups of students, rather than individuals, so that students have an opportunity to collaborate academically.

Appendix C

CLAS Stakeholders

Michele Jackson
Sallye McKee
Alphonse Keasley
Terry Mayes
Carl Wieman
Darna Dufour
Janice Brown
Lou McClelland
Suzanne Magnanini
Michael Grant
Elissa Guralnick
Katherine Eggert
Mitchell Handelsman
William Wood
Patricia Limerick
Diane Conlin
Julie Wong
Karen Jacobs
Shelby Wolf
James Curry
Jennifer Knight
Erica Ellingson
Robert Rupert
Susan Beatty
Valerie Otero
Christopher Bowman
William Briggs
Jim Burkhart
Gene Abrams
Robert Parson
Elizabeth Dunn
Elspeth Dusinberre
Russell Moore
Todd Gleeson
Veronica Bierbaum
Dale Mood
Daniel Barth
Steven Pollock
Stephen Mojzsis
Craig Jones
Dennis Van Gerven
Mary Kraus
Roger Enoka

Appendix D

CLAS Year 2 Interview Protocol

1. People at CU differ in a lot of ways regarding where they are from, their interests, their beliefs, their personal characteristics and so on. What differences are valuable for you as a member of the CU community? Can you give an example? What differences do you wish did not exist on campus? Can you give an example? In what ways could we (students and faculty) take more advantage of the diversity that exists on our campus?

2. Think of a course in which you learned something especially well. How do you know that you know it? How did you learn it? How did this course differ from others which didn't work as well for you? Have you had a life-changing event at CU?

3. Would you say that you are better able to learn things now than you were a few years ago? In what ways? If so, has anything or anybody helped you to improve? What do you KNOW you can do to improve, or improve even more, as a learner? Are there offices, agencies, or programs on campus that you have taken advantage of to become a better student? If not, what offices, agencies, or programs have you heard of that you think might be useful?

4. Tell us your impression of the relationship between learning and grades. How does getting a good grade relate to learning? Can there be a conflict between these? How? Would you rather get a good grade in a course and not learn anything or get an average grade in a course and learn a lot? Why? Have you had experiences in which you felt grades were used especially well or poorly in a class?

5. When you think about your life here at CU, what are the big pieces? Attending courses, studying, a job, volunteering, sports, drinking, socializing,... ? Please give me a list. Which of the things you mentioned are most important to you? Do you do these things on your own, or with others? Who? Tell us about your relationships with ADULTS (staff, faculty, community members) on campus. Are they involved in the important pieces of your life? If so, how?

6. What kind of things do you do to work on your courses outside of class time? Do you work with other students? Where? In what ways?

7. In what ways, if any, are you using the internet or computers in your education? How do you interact electronically with faculty or classmates? How would you characterize the value of such electronic interactions? How do they fit into your education?

8. Focusing on the courses you are taking this semester, how did you choose these courses? Can you say why these are good courses to take? Did you receive advice that influenced your choices? From whom did you receive advice (advisors, peers, parents, etc.)?

9. Considering all the courses you have taken (including your high school courses, if you are new to CU), in what ways do you see that they build on one another, or fit together in some other way?

10. How do your courses relate to other important parts of your life, if at all?

11. Are you learning ideas or skills that aren't connected with your courses? For example? How? Are you learning differently in these situations from the way you learn in your courses?

12. If you were to advise incoming students regarding the unwritten rules for success at CU, what would you say? (What do professors expect from students?; What kind of effort is required for success in courses?; How to manage time?)