

Physical science executive summary, November 6, 2012

(Yes, I voted. Did you??)

Physical Science serves a broad and multifaceted student group with goals in engineering, the physical sciences, allied health, the biological sciences, K-12 education, and general education. Every certificate and/or degree awarded for these areas rely on our classes. Anyone transferring to a 4 year school has taken at least one of our courses; many have taken several. The department primarily offers transfer level courses designed to satisfy the needs of the above groups.

The department encompasses five distinct disciplines with two umbrella courses (Physical and Earth Science). The department's mission and goals are in complete alignment with the college's core mission of transfer and CTE, and all aspects of student success. Our critical position in the educational pathways of our many students support the purposes and outcomes of the department, the college, and the needs of our community in this modern era.

Nationally there are a dwindling number of people entering STEM careers these days. This shortfall of STEM professionals in the United States is recognized as a **national security issue**, and additionally is critical for the sustainability of our society (an effect of technological growth coupled with baby-boomer retirements); it directly affects our community. This is a powerful initiative nationally (e.g. it fueled the funding of our STEM grant). Much recent work in the Physical Science department involves pedagogical and curricular work and infrastructure modernization based on these issues. Our STEM grant plays a HUGE role in this, and we are beginning to see a significant increase in STEM-related transfers on top of our current pipeline of students. Such activity directly addresses the waning number of those going into STEM careers.

Most of our courses meet BC's general education standards (the remainder being specialty/higher level classes). All of these transfer to the CSU/UC system as such, and all critical core science courses for majors are articulated in the CSU and UC systems. The majors degrees are rigorous transfer preparations for any of the core sciences, and we are working to implement the SB 1440 mandated transfer degrees covered by our area (geology, physics, chemistry, and geography).

To this end, physics and geology have applied for their TMC's. The statewide chemistry TMC is pending and expected to go live in the spring; we are fully prepared to teach those courses (the last of which is in the approval queue in curriculum). Geography's TMC is in review statewide; we are beginning to piece together the last course needed to conform with that as well, once it is finished.. A strong degree program is critical for anyone transferring, a significant number of which go to places outside of Bakersfield. The TMC's apply to all schools (e.g. the curriculum satisfies UC's requirements, and they accept the degrees for majors preparation on transfer). Combined with the healthy influx of project money through our STEM grant, these degrees will help our transfer students significantly, offering them the experiences needed to transfer successfully and fully as **third** year students.

Much has been done to work with the needs of BC's diverse student population and community with respect to demand, course offerings matching their goals, and staying on the front edge of educational trends. All areas within the department are actively assessing our classes to assure ourselves of having the most efficacious and appropriate approaches to teaching our students. This addresses both the material they need and the cognitive and metacognitive skills they should possess to succeed in the dynamic world we live in today.

Astronomy has three introductory level courses. An estimated 95% of the students take these classes to fulfill their general education physical science requirement. The planetarium is used by K-12 school groups as well as BC students. Community outreach efforts comprise an important part of the work we do, serving approximately 4500 K-12 students each year. BC also offers several special planetarium shows to the general public during the year.

Chemistry offers courses required for the career pathways of a wide variety of students. These core classes are prerequisites for on-campus programs (e.g. biology, engineering, allied health sciences, and our own degree programs). All transfer to many four-year institutions for programs such as engineering, architecture, the physical and biological sciences, related health careers (e.g. medicine, nursing, dentistry, pharmacy, veterinarian, ag. science, chiropractic), and education. A number also serve as general education requirements.

Geography and Geology offer classes that satisfy the general education requirements for many liberal studies majors as well as students transferring within the discipline. The courses give students insight into our physical and cultural worlds, and the processes that shape our planet and our civilizations. Newer courses have generated an infectious interest in the students; CSUB has shown great interest in these as they help transferring students into their disciplines.

Physics offers two sequences to students. A 2-semester trig-based general physics sequence is offered for the students going

into the professional fields such as medicine and many medically related fields, and also for students who need to take a lab science for their general education requirement. The other sequence is a 3-semester calculus-based physics, typically taken by science majors (physics, astronomy, engineering, chemistry, biology, and related fields).

The **Physical Science** and **Earth Science** classes are key courses in the science curriculum for liberal studies/teaching/education majors and for general education. Both are taught with labs. Together they comprise an articulated pair of classes for those seeking an educational degree at CSUB.

Concerning degrees and certificates awarded per year in several of our sub-disciplines:

Our programs have historically been viewed as service groups for other areas despite the large number of students passing through the classes. Degree awards have been minimal as a result, and we normally counsel our students to look to their institute of choice as the best pathway for moving onward. We are just beginning to wake up from this (not due to current circumstances) and recognize that we have been selling ourselves short. Interest is demonstrably picking up, and the TMCs will make a difference because of the complete coverage for the first two years of classes. All programs with TMCs are being strengthened by our STEM grant.

Regarding costs, etc., no data was available at the time of writing for statewide FTES/FTEF ratios or direct program costs. A table used to calculate what seemed the most appropriate estimate of our own FTES cost is attached. Among the STEM discipline areas we are the second lowest priced department. Honestly don't know what to say about the FTES/FTEF ratio.

Our classes are almost always packed, with attrition being at a level unsurprising for the area.

Retention and Success figures are also attached, coming from DataMart off the state Chancellor's office. Given the nature of our population in Bakersfield, it was deemed reasonable to look at both the statewide averages for each of the programs (including both physical and earth science courses) and a comparison with other colleges in the valley or what are believed to be similar sized places elsewhere. The data is arranged such that the state, BC, and the average for the other colleges are placed together. The other colleges' individual data is found to the right side of the pages.

Area	Total costs	FTEs	(Total \$)/(Total FTEs)
Biology, General	565158.42	197.16	
Microbiology	184411.6	47.19	2972.12
Anatomy & Physiology	578940.12	202.64	
Physical Sciences General	163118.24	26.6	
Physics General	202621.96	60.07	
Chemistry General	628659.05	225.37	2569.50
Astronomy	101827.14	36.95	
Geology	100392.36	73.17	
Earth Science	146064.42	75.81	
Geography	145494.24	81.2	
Health Professions General	887.75		
Radiologic Technology	343012.66	97.9	
Nursing	58315.3	79.56	4101.47
Registered Nursing	2012578.44	381.32	
Licensed Vocational Nursing	308178.38	51.3	
Certified Nursing Assistant	74001.66	44.85	
Emergency Medical Services	33779.04	35.25	
Mathematics, General	3000186.03	1320.49	2272.02
Engineering, General (Transfer)	206796.08	50.66	4082.04

(fall 2010, the only figure available at this time)

FTEF
14.868

FTEs/FTEF

38.95 yearly
19.48 semester

(I *think* the above was done correctly...)

Information from 2012-2013 Cost Per FTEs Data sheet

		Retention										
	State	BC	average of comparables	Am. Riv.	Ant. Val.	Barst.	Fresno	Merced	Modesto	Reedley	SJ Delta	Sequoias
2006												
Astronomy	81.5%	56.3%	77.2%	78.5%	88.1%	80.0%	88.6%	80.9%	72.3%	68.8%	62.0%	75.3%
Chemistry	78.5%	82.5%	80.0%	74.1%	87.9%	83.3%	81.1%	71.1%	81.8%	88.3%	70.7%	81.2%
Earth Science	81.4%	84.9%	86.1%	84.5%		92.7%						81.3%
Geography	82.6%	91.7%	84.0%	78.7%	92.6%		88.4%	77.5%	79.4%	90.9%	75.1%	89.7%
Geology	84.7%	89.4%	84.5%	80.5%	85.8%	72.5%	86.0%	95.2%	81.8%	93.5%	65.5%	100.0%
Physical Science	79.8%	89.8%	86.5%	81.3%	83.8%		81.6%	88.1%	84.1%	95.1%	#DIV/0!	91.6%
Physics	81.3%	78.9%	84.3%	82.0%	88.9%		86.6%	89.8%	83.0%	84.6%	77.3%	82.1%
2007												
Astronomy	82.3%	57.1%	79.3%	79.5%	77.0%	95.9%	85.6%	76.3%	78.5%	80.0%	75.0%	65.7%
Chemistry	79.5%	79.7%	79.6%	79.0%	80.9%	80.8%	83.4%	69.0%	81.1%	88.2%	75.1%	79.0%
Earth Science	82.4%	88.0%	89.5%	84.6%								94.4%
Geography	83.5%	90.3%	83.5%	77.7%	85.7%		87.0%	80.6%	82.0%	86.5%	77.6%	91.0%
Geology	84.2%	87.8%	84.0%	85.3%	75.9%	90.9%	90.3%	79.3%	81.0%	89.4%	64.2%	100.0%
Physical Science	80.6%	85.5%	85.8%	82.1%	84.7%		81.2%	90.0%	87.5%	90.2%		85.1%
Physics	81.5%	89.9%	83.8%	84.9%	80.8%		84.1%	88.0%	86.5%	90.2%	76.7%	79.4%
2008												
Astronomy	83.7%	61.1%	80.2%	81.4%	81.7%	72.7%	86.4%	88.9%	80.4%	93.5%	72.5%	64.2%
Chemistry	80.4%	76.0%	78.2%	77.8%	79.7%	77.0%	78.8%	64.7%	76.7%	89.5%	76.9%	82.8%
Earth Science	83.9%	90.9%	83.7%	89.7%	62.9%							93.5%
Geography	85.1%	86.7%	85.3%	81.5%	87.2%		89.2%	79.0%	80.8%	89.8%	82.4%	92.4%
Geology	85.3%	88.4%	83.3%	83.8%	77.2%	84.2%	87.2%	88.1%	82.9%	90.6%	72.1%	
Physical Science	83.6%	90.1%	88.9%	86.7%	87.5%		84.6%	91.8%	88.7%	91.7%		91.2%
Physics	82.3%	77.3%	84.7%	84.6%	86.1%		85.6%	85.4%	85.4%	88.3%	80.6%	82.1%
2009												
Astronomy	84.0%	69.7%	82.4%	83.3%	91.1%	88.2%	87.0%	82.4%	92.2%	95.2%	44.2%	78.3%
Chemistry	80.7%	78.4%	78.8%	78.8%	85.0%	68.1%	84.6%	71.2%	73.6%	92.1%	75.4%	80.9%
Earth Science	84.7%	92.0%	88.8%	85.7%	87.8%							90.5%
Geography	85.5%	89.8%	86.6%	84.1%	87.7%		91.1%	80.9%	85.8%	91.3%	79.1%	92.6%
Geology	85.8%	86.6%	84.4%	86.5%	85.7%	86.7%	84.5%	76.0%	78.2%	94.6%	67.6%	100.0%
Physical Science	84.6%	90.3%	87.6%	84.7%	89.0%		81.3%	82.4%	89.4%	96.7%		89.9%
Physics	82.6%	85.4%	85.5%	84.1%	73.2%		87.3%	87.1%	88.9%	89.7%	84.2%	89.8%
2010												
Astronomy	84.0%	63.8%	82.4%	79.6%	87.1%	80.2%	94.0%	80.8%	84.3%	95.6%	65.4%	74.1%
Chemistry	81.1%	79.1%	80.2%	76.0%	87.9%	62.8%	83.9%	83.6%	79.6%	92.4%	72.1%	83.5%
Earth Science	83.7%	87.5%	87.7%	86.8%	83.3%	85.2%						95.2%
Geography	85.3%	87.7%	85.9%	83.7%	87.9%		90.5%	83.4%	77.7%	89.3%	80.6%	94.2%
Geology	86.5%	89.1%	84.5%	89.1%	86.0%	81.9%	92.4%	88.9%	79.1%	92.2%	52.4%	98.3%
Physical Science	84.7%	85.4%	86.2%	77.5%	83.0%		80.8%	93.0%	88.5%	90.2%		90.8%
Physics	82.7%	90.4%	85.7%	87.6%	81.6%		84.5%	89.0%	93.8%	90.6%	81.5%	77.0%
2011 fall												
Astronomy	84.8%	67.8%	76.8%	30.0%	88.2%	82.2%	92.9%	94.1%	84.7%	97.0%	41.1%	81.5%
Chemistry	80.9%	80.2%	80.3%	75.4%	85.0%	69.0%	84.0%	80.6%	81.1%	92.8%	75.4%	79.7%
Earth Science	85.0%	84.8%	88.6%	83.9%	84.6%	92.6%						93.1%
Geography	85.6%	89.5%	86.1%	84.9%	91.7%		92.0%	81.3%	78.7%	87.9%	79.8%	92.3%
Geology	85.6%	84.5%	84.1%	84.0%	90.7%	80.8%	85.0%	96.0%	86.4%	92.2%	54.5%	87.4%
Physical Science	85.5%	80.8%	89.2%	85.7%	84.6%		83.8%	88.2%	91.0%	98.4%		92.7%
Physics	82.0%	94.4%	87.7%	83.2%	86.9%		89.3%	94.4%	85.6%	87.4%	80.6%	94.3%

Success

	State	BC	average of comparables	Am. Riv.	Ant. Val.	Barst.	Fresno	Merced	Modesto	Reedley	SJ Delta	Sequoias
2006												
Astronomy	63.9%	25.2%	61.7%	63.3%	71.9%	70.9%	72.9%	63.2%	48.7%	62.5%	51.2%	52.1%
Chemistry	65.5%	65.8%	61.9%	58.3%	74.8%	54.2%	56.4%	61.2%	64.9%	68.0%	57.9%	58.0%
Earth Science	63.4%	69.1%	80.7%	73.7%		92.7%						68.8%
Geography	64.2%	71.4%	60.0%	64.7%	77.7%		64.8%	50.0%	52.4%	64.2%	39.7%	71.3%
Geology	69.0%	78.0%	69.4%	69.8%	64.4%	62.5%	59.4%	90.5%	65.6%	74.7%	40.1%	98.3%
Physical Science	63.3%	73.7%	71.0%	64.1%	66.9%		61.8%	74.9%	70.2%	85.2%		67.0%
Physics	71.2%	67.2%	71.4%	73.1%	72.6%		71.7%	82.3%	71.4%	64.1%	65.6%	72.3%
2007												
Astronomy	64.5%	29.5%	59.0%	63.5%	62.7%	71.4%	64.8%	60.4%	56.6%	62.2%	49.2%	44.4%
Chemistry	66.5%	62.0%	62.8%	63.7%	66.5%	67.3%	62.1%	57.0%	62.1%	68.7%	61.6%	57.2%
Earth Science	64.1%	72.2%	78.8%	74.3%		74.3%						83.3%
Geography	64.8%	68.0%	60.4%	64.6%	65.9%		60.0%	62.2%	50.5%	61.0%	49.8%	73.3%
Geology	68.7%	73.3%	70.5%	72.6%	55.9%	86.4%	69.9%	72.4%	66.6%	75.5%	39.4%	98.2%
Physical Science	62.6%	75.8%	69.9%	66.0%	67.7%		57.5%	77.1%	75.1%	78.0%		64.0%
Physics	70.5%	77.7%	70.2%	74.7%	60.9%		70.2%	78.3%	71.6%	76.7%	66.3%	67.3%
2008												
Astronomy	65.6%	33.2%	61.9%	60.0%	65.1%	57.6%	66.9%	66.3%	56.9%	84.4%	48.4%	49.5%
Chemistry	67.2%	57.2%	59.5%	63.2%	64.8%	49.2%	56.2%	55.3%	57.1%	66.0%	64.1%	62.9%
Earth Science	64.1%	74.7%	67.3%	74.3%	40.0%	85.7%						76.1%
Geography	65.9%	65.1%	61.7%	68.7%	67.0%		58.7%	56.4%	54.8%	63.5%	52.8%	78.5%
Geology	68.7%	70.3%	66.8%	71.5%	52.0%	73.7%	64.4%	80.6%	69.9%	72.9%	53.9%	
Physical Science	63.9%	78.1%	70.8%	68.9%	68.3%		54.5%	76.4%	68.9%	79.2%		77.8%
Physics	71.1%	65.6%	71.3%	75.9%	69.0%		69.9%	79.6%	73.6%	71.0%	70.5%	65.4%
2009												
Astronomy	65.7%	40.8%	64.6%	64.6%	77.0%	73.1%	66.1%	63.0%	64.4%	90.3%	32.5%	50.4%
Chemistry	67.4%	61.9%	60.0%	64.1%	70.1%	42.0%	61.8%	57.5%	51.5%	71.5%	64.0%	61.2%
Earth Science	64.9%	69.0%	73.6%	71.4%	65.3%	71.4%						84.1%
Geography	65.5%	65.6%	62.1%	64.7%	66.7%		60.9%	54.3%	62.0%	60.1%	51.8%	79.1%
Geology	68.5%	72.5%	70.7%	75.0%	67.6%	77.8%	59.5%	64.0%	61.4%	76.8%	58.5%	100.0%
Physical Science	62.9%	79.1%	68.4%	67.2%	63.2%		49.2%	61.4%	77.3%	91.8%		67.6%
Physics	71.5%	72.6%	70.5%	75.1%	59.2%		65.3%	80.6%	69.3%	72.1%	75.9%	71.1%
2010												
Astronomy	66.1%	38.6%	63.5%	61.5%	77.7%	60.4%	72.2%	68.4%	58.7%	82.4%	41.9%	46.3%
Chemistry	67.9%	62.7%	61.0%	60.1%	75.6%	36.4%	62.5%	66.8%	54.3%	71.7%	61.5%	59.2%
Earth Science	65.2%	68.5%	67.0%	70.0%	56.3%	62.3%						82.5%
Geography	65.0%	65.7%	60.8%	65.9%	63.8%		56.0%	64.2%	45.4%	65.3%	51.9%	79.0%
Geology	69.5%	76.0%	66.4%	74.1%	57.0%	65.1%	62.1%	82.2%	69.6%	70.1%	32.3%	92.6%
Physical Science	65.7%	68.5%	72.5%	63.2%	58.7%		62.5%	80.5%	72.7%	88.5%		71.9%
Physics	71.7%	82.6%	71.8%	77.6%	68.2%		66.3%	86.0%	75.8%	74.1%	68.5%	63.5%
2011 fall												
Astronomy	66.2%	37.9%	66.0%	20.0%	77.4%	68.9%	72.7%	88.1%	56.8%	87.9%	24.7%	51.9%
Chemistry	67.5%	63.5%	60.3%	59.4%	71.6%	47.6%	59.0%	64.7%	57.9%	68.2%	63.2%	50.0%
Earth Science	65.6%	55.1%	68.9%	71.4%	50.0%	70.4%						86.2%
Geography	66.0%	69.8%	62.4%	71.5%	71.4%		64.5%	64.2%	49.2%	63.7%	50.0%	74.2%
Geology	68.0%	65.3%	65.1%	73.2%	73.2%	53.8%	68.0%	88.0%	69.7%	74.5%	25.2%	68.0%
Physical Science	65.2%	69.2%	73.3%	75.5%	62.2%		60.4%	71.3%	75.0%	88.5%		82.3%
Physics	70.2%	85.7%	73.9%	73.3%	74.5%		72.5%	83.2%	70.4%	66.5%	69.9%	80.0%