



**Outcome # – Collect, interpret, and analyze quantitative data.**

**2. Assessment Methods: Artifacts of Student Learning**

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe and identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

Outcome #1 – Students' overall percentiles on the ACS organic exam were collected for CHEM 2440. Students' overall percentiles on the ACS inorganic exam were collected for CHEM 4500. Students' overall percentiles on the ACS exam was not collected. Only general chemistry and organic chemistry are

offered in Madrid, and these courses very rarely include majors.

**3. What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and include them in/with this report document (do not just refer to the assessment plan).**

Raw scores were tabulated by the instructors of the courses and sent to the undergraduate program coordinator. Percentile scores were evaluated using the following criteria: >66 = exceeds, 45-66 = meets, 33-44 = approaching,

and <33 does not meet. Percentage scores were evaluated using the following criteria: >89% = exceeds, 80-89% = meets, 70-79% = approaching, and <70% does not meet.

#### 4. Data/Results

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

Outcome 9.1 - Students will be able to... (A) 98.0% (B) 97.7% (C) 96.1% (D) 92.7% (E) 91.7% (F) 91.2% (G) 91.2% (H) 91.2% (I) 91.2% (J) 91.2% (K) 91.2% (L) 91.2% (M) 91.2% (N) 91.2% (O) 91.2% (P) 91.2% (Q) 91.2% (R) 91.2% (S) 91.2% (T) 91.2% (U) 91.2% (V) 91.2% (W) 91.2% (X) 91.2% (Y) 91.2% (Z) 91.2% (AA) 91.2% (AB) 91.2% (AC) 91.2% (AD) 91.2% (AE) 91.2% (AF) 91.2% (AG) 91.2% (AH) 91.2% (AI) 91.2% (AJ) 91.2% (AK) 91.2% (AL) 91.2% (AM) 91.2% (AN) 91.2% (AO) 91.2% (AP) 91.2% (AQ) 91.2% (AR) 91.2% (AS) 91.2% (AT) 91.2% (AU) 91.2% (AV) 91.2% (AW) 91.2% (AX) 91.2% (AY) 91.2% (AZ) 91.2% (BA) 91.2% (BB) 91.2% (BC) 91.2% (BD) 91.2% (BE) 91.2% (BF) 91.2% (BG) 91.2% (BH) 91.2% (BI) 91.2% (BJ) 91.2% (BK) 91.2% (BL) 91.2% (BM) 91.2% (BN) 91.2% (BO) 91.2% (BP) 91.2% (BQ) 91.2% (BR) 91.2% (BS) 91.2% (BT) 91.2% (BU) 91.2% (BV) 91.2% (BW) 91.2% (BX) 91.2% (BY) 91.2% (BZ) 91.2% (CA) 91.2% (CB) 91.2% (CC) 91.2% (CD) 91.2% (CE) 91.2% (CF) 91.2% (CG) 91.2% (CH) 91.2% (CI) 91.2% (CJ) 91.2% (CK) 91.2% (CL) 91.2% (CM) 91.2% (CN) 91.2% (CO) 91.2% (CP) 91.2% (CQ) 91.2% (CR) 91.2% (CS) 91.2% (CT) 91.2% (CU) 91.2% (CV) 91.2% (CW) 91.2% (CX) 91.2% (CY) 91.2% (CZ) 91.2% (DA) 91.2% (DB) 91.2% (DC) 91.2% (DD) 91.2% (DE) 91.2% (DF) 91.2% (DG) 91.2% (DH) 91.2% (DI) 91.2% (DJ) 91.2% (DK) 91.2% (DL) 91.2% (DM) 91.2% (DN) 91.2% (DO) 91.2% (DP) 91.2% (DQ) 91.2% (DR) 91.2% (DS) 91.2% (DT) 91.2% (DU) 91.2% (DV) 91.2% (DW) 91.2% (DX) 91.2% (DY) 91.2% (DZ) 91.2% (EA) 91.2% (EB) 91.2% (EC) 91.2% (ED) 91.2% (EE) 91.2% (EF) 91.2% (EG) 91.2% (EH) 91.2% (EI) 91.2% (EJ) 91.2% (EK) 91.2% (EL) 91.2% (EM) 91.2% (EN) 91.2% (EO) 91.2% (EP) 91.2% (EQ) 91.2% (ER) 91.2% (ES) 91.2% (ET) 91.2% (EU) 91.2% (EV) 91.2% (EW) 91.2% (EX) 91.2% (EY) 91.2% (EZ) 91.2% (FA) 91.2% (FB) 91.2% (FC) 91.2% (FD) 91.2% (FE) 91.2% (FF) 91.2% (FG) 91.2% (FH) 91.2% (FI) 91.2% (FJ) 91.2% (FK) 91.2% (FL) 91.2% (FM) 91.2% (FN) 91.2% (FO) 91.2% (FP) 91.2% (FQ) 91.2% (FR) 91.2% (FS) 91.2% (FT) 91.2% (FU) 91.2% (FV) 91.2% (FW) 91.2% (FX) 91.2% (FY) 91.2% (FZ) 91.2% (GA) 91.2% (GB) 91.2% (GC) 91.2% (GD) 91.2% (GE) 91.2% (GF) 91.2% (GG) 91.2% (GH) 91.2% (GI) 91.2% (GJ) 91.2% (GK) 91.2% (GL) 91.2% (GM) 91.2% (GN) 91.2% (GO) 91.2% (GP) 91.2% (GQ) 91.2% (GR) 91.2% (GS) 91.2% (GT) 91.2% (GU) 91.2% (GV) 91.2% (GW) 91.2% (GX) 91.2% (GY) 91.2% (GZ) 91.2% (HA) 91.2% (HB) 91.2% (HC) 91.2% (HD) 91.2% (HE) 91.2% (HF) 91.2% (HG) 91.2% (HH) 91.2% (HI) 91.2% (HJ) 91.2% (HK) 91.2% (HL) 91.2% (HM) 91.2% (HN) 91.2% (HO) 91.2% (HP) 91.2% (HQ) 91.2% (HR) 91.2% (HS) 91.2% (HT) 91.2% (HU) 91.2% (HV) 91.2% (HW) 91.2% (HX) 91.2% (HY) 91.2% (HZ) 91.2% (IA) 91.2% (IB) 91.2% (IC) 91.2% (ID) 91.2% (IE) 91.2% (IF) 91.2% (IG) 91.2% (IH) 91.2% (II) 91.2% (IJ) 91.2% (IK) 91.2% (IL) 91.2% (IM) 91.2% (IN) 91.2% (IO) 91.2% (IP) 91.2% (IQ) 91.2% (IR) 91.2% (IS) 91.2% (IT) 91.2% (IU) 91.2% (IV) 91.2% (IW) 91.2% (IX) 91.2% (IY) 91.2% (IZ) 91.2% (JA) 91.2% (JB) 91.2% (JC) 91.2% (JD) 91.2% (JE) 91.2% (JF) 91.2% (JG) 91.2% (JH) 91.2% (JI) 91.2% (JJ) 91.2% (JK) 91.2% (JL) 91.2% (JM) 91.2% (JN) 91.2% (JO) 91.2% (JP) 91.2% (JQ) 91.2% (JR) 91.2% (JS) 91.2% (JT) 91.2% (JU) 91.2% (JV) 91.2% (JW) 91.2% (JX) 91.2% (JY) 91.2% (JZ) 91.2% (KA) 91.2% (KB) 91.2% (KC) 91.2% (KD) 91.2% (KE) 91.2% (KF) 91.2% (KG) 91.2% (KH) 91.2% (KI) 91.2% (KJ) 91.2% (KK) 91.2% (KL) 91.2% (KM) 91.2% (KN) 91.2% (KO) 91.2% (KP) 91.2% (KQ) 91.2% (KR) 91.2% (KS) 91.2% (KT) 91.2% (KU) 91.2% (KV) 91.2% (KW) 91.2% (KX) 91.2% (KY) 91.2% (KZ) 91.2% (LA) 91.2% (LB) 91.2% (LC) 91.2% (LD) 91.2% (LE) 91.2% (LF) 91.2% (LG) 91.2% (LH) 91.2% (LI) 91.2% (LJ) 91.2% (LK) 91.2% (LL) 91.2% (LM) 91.2% (LN) 91.2% (LO) 91.2% (LP) 91.2% (LQ) 91.2% (LR) 91.2% (LS) 91.2% (LT) 91.2% (LU) 91.2% (LV) 91.2% (LW) 91.2% (LX) 91.2% (LY) 91.2% (LZ) 91.2% (MA) 91.2% (MB) 91.2% (MC) 91.2% (MD) 91.2% (ME) 91.2% (MF) 91.2% (MG) 91.2% (MH) 91.2% (MI) 91.2% (MJ) 91.2% (MK) 91.2% (ML) 91.2% (MN) 91.2% (MO) 91.2% (MP) 91.2% (MQ) 91.2% (MR) 91.2% (MS) 91.2% (MT) 91.2% (MU) 91.2% (MV) 91.2% (MW) 91.2% (MX) 91.2% (MY) 91.2% (MZ) 91.2% (NA) 91.2% (NB) 91.2% (NC) 91.2% (ND) 91.2% (NE) 91.2% (NF) 91.2% (NG) 91.2% (NH) 91.2% (NI) 91.2% (NJ) 91.2% (NK) 91.2% (NL) 91.2% (NM) 91.2% (NN) 91.2% (NO) 91.2% (NP) 91.2% (NQ) 91.2% (NR) 91.2% (NS) 91.2% (NT) 91.2% (NU) 91.2% (NV) 91.2% (NW) 91.2% (NX) 91.2% (NY) 91.2% (NZ) 91.2% (OA) 91.2% (OB) 91.2% (OC) 91.2% (OD) 91.2% (OE) 91.2% (OF) 91.2% (OG) 91.2% (OH) 91.2% (OI) 91.2% (OJ) 91.2% (OK) 91.2% (OL) 91.2% (OM) 91.2% (ON) 91.2% (OO) 91.2% (OP) 91.2% (OQ) 91.2% (OR) 91.2% (OS) 91.2% (OT) 91.2% (OU) 91.2% (OV) 91.2% (OW) 91.2% (OX) 91.2% (OY) 91.2% (OZ) 91.2% (PA) 91.2% (PB) 91.2% (PC) 91.2% (PD) 91.2% (PE) 91.2% (PF) 91.2% (PG) 91.2% (PH) 91.2% (PI) 91.2% (PJ) 91.2% (PK) 91.2% (PL) 91.2% (PM) 91.2% (PN) 91.2% (PO) 91.2% (PP) 91.2% (PQ) 91.2% (PR) 91.2% (PS) 91.2% (PT) 91.2% (PU) 91.2% (PV) 91.2% (PW) 91.2% (PX) 91.2% (PY) 91.2% (PZ) 91.2% (QA) 91.2% (QB) 91.2% (QC) 91.2% (QD) 91.2% (QE) 91.2% (QF) 91.2% (QG) 91.2% (QH) 91.2% (QI) 91.2% (QJ) 91.2% (QK) 91.2% (QL) 91.2% (QM) 91.2% (QN) 91.2% (QO) 91.2% (QP) 91.2% (QQ) 91.2% (QR) 91.2% (QS) 91.2% (QT) 91.2% (QU) 91.2% (QV) 91.2% (QW) 91.2% (QX) 91.2% (QY) 91.2% (QZ) 91.2% (RA) 91.2% (RB) 91.2% (RC) 91.2% (RD) 91.2% (RE) 91.2% (RF) 91.2% (RG) 91.2% (RH) 91.2% (RI) 91.2% (RJ) 91.2% (RK) 91.2% (RL) 91.2% (RM) 91.2% (RN) 91.2% (RO) 91.2% (RP) 91.2% (RQ) 91.2% (RR) 91.2% (RS) 91.2% (RT) 91.2% (RU) 91.2% (RV) 91.2% (RW) 91.2% (RX) 91.2% (RY) 91.2% (RZ) 91.2% (SA) 91.2% (SB) 91.2% (SC) 91.2% (SD) 91.2% (SE) 91.2% (SF) 91.2% (SG) 91.2% (SH) 91.2% (SI) 91.2% (SJ) 91.2% (SK) 91.2% (SL) 91.2% (SM) 91.2% (SN) 91.2% (SO) 91.2% (SP) 91.2% (SQ) 91.2% (SR) 91.2% (SS) 91.2% (ST) 91.2% (SU) 91.2% (SV) 91.2% (SW) 91.2% (SX) 91.2% (SY) 91.2% (SZ) 91.2% (TA) 91.2% (TB) 91.2% (TC) 91.2% (TD) 91.2% (TE) 91.2% (TF) 91.2% (TG) 91.2% (TH) 91.2% (TI) 91.2% (TJ) 91.2% (TK) 91.2% (TL) 91.2% (TM) 91.2% (TN) 91.2% (TO) 91.2% (TP) 91.2% (TQ) 91.2% (TR) 91.2% (TS) 91.2% (TT) 91.2% (TU) 91.2% (TV) 91.2% (TW) 91.2% (TX) 91.2% (TY) 91.2% (TZ) 91.2% (UA) 91.2% (UB) 91.2% (UC) 91.2% (UD) 91.2% (UE) 91.2% (UF) 91.2% (UG) 91.2% (UH) 91.2% (UI) 91.2% (UJ) 91.2% (UK) 91.2% (UL) 91.2% (UM) 91.2% (UN) 91.2% (UO) 91.2% (UP) 91.2% (UQ) 91.2% (UR) 91.2% (US) 91.2% (UT) 91.2% (UU) 91.2% (UV) 91.2% (UW) 91.2% (UX) 91.2% (UY) 91.2% (UZ) 91.2% (VA) 91.2% (VB) 91.2% (VC) 91.2% (VD) 91.2% (VE) 91.2% (VF) 91.2% (VG) 91.2% (VH) 91.2% (VI) 91.2% (VJ) 91.2% (VK) 91.2% (VL) 91.2% (VM) 91.2% (VN) 91.2% (VO) 91.2% (VP) 91.2% (VQ) 91.2% (VR) 91.2% (VS) 91.2% (VT) 91.2% (VU) 91.2% (VV) 91.2% (VW) 91.2% (VX) 91.2% (VY) 91.2% (VZ) 91.2% (WA) 91.2% (WB) 91.2% (WC) 91.2% (WD) 91.2% (WE) 91.2% (WF) 91.2% (WG) 91.2% (WH) 91.2% (WI) 91.2% (WJ) 91.2% (WK) 91.2% (WL) 91.2% (WM) 91.2% (WN) 91.2% (WO) 91.2% (WP) 91.2% (WQ) 91.2% (WR) 91.2% (WS) 91.2% (WT) 91.2% (WU) 91.2% (WV) 91.2% (WW) 91.2% (WX) 91.2% (WY) 91.2% (WZ) 91.2% (XA) 91.2% (XB) 91.2% (XC) 91.2% (XD) 91.2% (XE) 91.2% (XF) 91.2% (XG) 91.2% (XH) 91.2% (XI) 91.2% (XJ) 91.2% (XK) 91.2% (XL) 91.2% (XM) 91.2% (XN) 91.2% (XO) 91.2% (XP) 91.2% (XQ) 91.2% (XR) 91.2% (XS) 91.2% (XT) 91.2% (XU) 91.2% (XV) 91.2% (XW) 91.2% (XX) 91.2% (XY) 91.2% (XZ) 91.2% (YA) 91.2% (YB) 91.2% (YC) 91.2% (YD) 91.2% (YE) 91.2% (YF) 91.2% (YG) 91.2% (YH) 91.2% (YI) 91.2% (YJ) 91.2% (YK) 91.2% (YL) 91.2% (YM) 91.2% (YN) 91.2% (YO) 91.2% (YP) 91.2% (YQ) 91.2% (YR) 91.2% (YS) 91.2% (YT) 91.2% (YU) 91.2% (YV) 91.2% (YW) 91.2% (YX) 91.2% (YY) 91.2% (YZ) 91.2% (ZA) 91.2% (ZB) 91.2% (ZC) 91.2% (ZD) 91.2% (ZE) 91.2% (ZF) 91.2% (ZG) 91.2% (ZH) 91.2% (ZI) 91.2% (ZJ) 91.2% (ZK) 91.2% (ZL) 91.2% (ZM) 91.2% (ZN) 91.2% (ZO) 91.2% (ZP) 91.2% (ZQ) 91.2% (ZR) 91.2% (ZS) 91.2% (ZT) 91.2% (ZU) 91.2% (ZV) 91.2% (ZW) 91.2% (ZX) 91.2% (ZY) 91.2% (ZZ) 91.2%

Changes to the Curriculum or Pedagogies	<ul style="list-style-type: none"> <li>x Course content</li> <li>x Teaching techniques</li> <li>x Improvements in technology</li> <li>x Prerequisites</li> </ul>	<ul style="list-style-type: none"> <li>x Course sequence</li> <li>x New courses</li> <li>x Deletion of courses</li> <li>x Changes in frequency or scheduling of course offerings</li> </ul>
Changes to the Assessment Plan	<ul style="list-style-type: none"> <li>x Student learning outcomes</li> <li>x Artifacts of student learning</li> <li>x Evaluation process</li> </ul>	<ul style="list-style-type: none"> <li>x Evaluation tools (e.g., rubrics)</li> <li>x Data collection methods</li> <li>x Frequency of data collection</li> </ul>

Please describe the actions you are taking as a result of these findings.

The department will be taking the following actions:

1. The organic chemistry lecture course is now being taught in a semi-flipped format that will devote significantly more time to in-class problem solving.
2. We will no longer use ACS physical chemistry exam questions to measure outcomes related to lab techniques.
3. We will use additional questions on the ACS physical chemistry exam to measure outcomes related to quantitative questions.
4. We will use a version of the ACS physical chemistry exam that has percentiles available. The ACS physical chemistry exam used in the past did not have percentiles available, so percentages were used, which makes it difficult to compare to older or newer version of the exam as difficulty changes and does not allow for comparison to national norms.
5. We will include additional inorganic data in the future as it was discovered that this year's analysis was missing a year of data.

If no changes are being made, please explain why.

No changes are being made to the analytical and biochemistry outcomes. We observed that, in aggregate, the students are meeting or exceeding the related learning objectives.

## 7. Closing the Loop: Review of Previous Assessment Findings and Changes

### A. What is at least one change your program has implemented in recent years as a result of assessment data?

Earlier this year, we decided to change the assessment method for our analytical courses. For this program, we are no longer collecting data on technique-specific questions from the ACS analytical exam. The faculty felt that collecting the semester score in analytical 1 lab was sufficient to demonstrate proficiency of basic lab techniques. Also, we are no longer collecting data on quantitative questions from the ACS analytical exam. Instead, we are collecting students' semester scores in CHEM 2200.

### B. How has this change/have these changes been assessed?

These changes are reflected in our current assessment plan. We are no longer collecting data on technique-specific or quantitative questions from the ACS analytical exam. We have always collected the semester score in analytical 1 lab, so that will continue. We have begun collecting students' semester scores in CHEM 2200. That data was assessed in this report.

### C. What were the findings of the assessment?