CALIFORNIA STATE UNIVERSITY, CHICO

ANNUAL PROGRAM ASSESSMENT REPORT

Save your Report with the following file name: APAR-22-23-Dept OR Program Name, for example APAR-22-23-CMST

Date: 9.26.22

Due: 9/30/2022

I. Assessment of Program Level Student Learning Outcomes (SLOs)

1. Program Name:

BS Exercise Physiology

2. Program Level Student Learning Outcomes:

- **Content Knowledge** – Students will demonstrate knowledge and disciplinary concepts related to the field of Kinesiology
- **Communication** – Students will apply knowledge of effective verbal, nonverbal, and media communication techniques to enhance learning and engagement in physical activity
- **Reflection and Critical Thinking** – Students will demonstrate reflection and critical thinking in order to refine professional practice.
- **Programming and Assessment** – Students will demonstrate evidence-based knowledge and skills (and best practices) for assessing client/student needs and for designing, implementing and evaluating programs.
- **Professionalism and Ethics** – Students will demonstrate professional behaviors, including commitment to excellence, valuing diversity and collaboration, service to others, and techniques for lifelong learning.
- **Value Physical Activity and Fitness** – Students will articulate a philosophy that physical activity programs are important to health and well-being of individuals, and that physical activity can foster self-expression, development, and learning.

Additional SLOs for the B.S. in Exercise Physiology

1) Develop knowledge of the integration of physiological, biomechanical, and psychological sciences.
2) Become reflective professionals that are knowledgeable consumers of exercise science research in order to prescribe evidence-based exercise programs.
3) Develop the skills necessary to plan, implement and evaluate effective exercise- or health-related exercise programs.
4) Demonstrate effective written and oral communication skills appropriate for success and advancement in the field of exercise science.

3. Course Alignment Matrix:

B.S. Exercise Physiology Course Alignment Matrix

Key: I = Introductory Level P = Practice Level M = Mastery Level

		SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6
KINE 316	Principles of Sports Injury Management	P	I	P	P	P	NA
KINE 320	Foundations of Exercise and Sport Psychology	I	P	P	NA	P	P
KINE 322	Biomechanics	P	I	P	I	P	I
KINE 323	Physiology of Exercise	M	P	P/M	P/M	I	P
KINE 324	Exercise Physiology: Metabolism	M	M	P/M	NA	M	P
KINE 335	Youth Fitness	P	P	P	P	P	P
KINE 386	Sports Epidemiology	P	P	M	I	I	M
KINE 388	Personal Training	P	I	I	P	P	M
KINE 390	Principles of Strength and Conditioning	P	I	P	M	P	M
KINE 480	Exercise Testing and Prescription	P	I	I	P	P	P
KINE 482	Exercise Pathophysiology	M	P	M	NA	M	M
KINE 505	Exercise Behavior and Adherence	M	P	P	P	P	M
KINE 524	Biomechanical Analysis	M	P	M	P	P	I
KINE 530	Advanced Principles of Strength and Conditioning	P	P	P	P	P	P

4. Closing the Loop: Departmental or College Discussions/Feedback:

Annual assessment was paused last year due to COVID, therefore no assessment results from last year are available for review. The last assessment results for this program (2018-19) indicated:

- Freshman are hitting the 4-year and 6-year graduation and persistence targets (2018). To hit the 2025 targets, 4-yr graduation rates must increase by 4.8%
- Transfer 2- and 4-year graduation rates were not achieved and demand department attention
- Exercise physiology persistence rates exceed university averages
- Exercise physiology students are taking more than the required 120 units (on average 8.7 units)
- Exercise physiology student's GPA at graduation is slightly lower than the university average (.37 lower)
- Equity Gaps do exist for Underrepresented Minority (.31 GPA) and Pell-eligible (.20 GPA) students

How was last year's assessment results shared with the departmental faculty? Please summarize and/or provide the results of this sharing or discussion? Was the program provided with any college dean-level feedback? If so, please summarize and provide any departmental feedback to the college feedback provided.

Assessment results were discussed in KINE department meetings. Overall, results were well received as they indicated positive results when examining persistence targets. Transfer rates and equity gaps (especially underrepresented minority and Pell-eligible) were discussed at length and it was determined that action was required in these areas (see section 5).

Assessment results were provided to the college dean's office. While preliminary conversations with the associate dean significantly impacted presentation of assessment results, no formal feedback was provided regarding final report submissions.

5. Closing the Loop: Programmatic Actions:

What has the program done to implement the planned program improvement actions from the last annual assessment report or from previous assessment reports? What is left to do and how/will it be accomplished?

In response, the department applied and was accepted to engage in the university Equity Minded Program Initiative (EMPI), aimed at examining and addressing equity gaps. As a results two specific strategies were implemented:

- Ensuring consistency and alignment of learning objectives in core exercise physiology courses
- Tutoring for core KINE sciences courses (KINE 202 'Anatomical Kinesiology'; KINE 322 'Biomechanics'; KINE 323 'Physiology of Exercise'

Still to be performed are detailed assessment of the impact of these implemented strategies in terms of student perception, persistence rates, and DFW prevalence.

6. **What is your current Assessment Plan?**

What SLOs have been assessed (since last 5 year review) and which SLOs are planned to be assessed in next 2-3 years. The plan may alter over time, but what is the plan at this time?

- 2018-19 – all SLO's assessed (variables: graduation rates, retention, equity gaps)
- 2016-17 – **Communication** - Students will apply knowledge of effective verbal, nonverbal, and media communication techniques to enhance learning and engagement in physical activity.
- 2015-16 – **Professionalism and Ethics** - Students will demonstrate professional behaviors, including commitment to excellence, valuing diversity and collaboration, service to others, and techniques for lifelong learning.

Next 2-3 years:

- 2022-23 – **Reflection and Critical Thinking** - Students will demonstrate reflection and critical thinking in order to refine professional practice
- 2023-24 – **Programming and Assessment** – Students will demonstrate evidence-based knowledge and skills (and best practices) for assessing client/student needs and for designing, implementing and evaluating programs.

7. Learning Outcome(s) Assessed:

Which learning outcome(s) was or were assessed this year?

- **Content Knowledge** – Students will demonstrate knowledge and disciplinary concepts related to the field of Kinesiology

6. Artifact Components (assignments, rubric, and benchmark):

Describe the components of your artifact:

a. What artifact(s) did you assess and for what course(s)?

Biomechanics Concept Inventory (BCI3): During the Spring 2022 semester, Exercise Physiology BS students enrolled in two sections (N=24) of KINE 322 completed a pre- and post-test given during the first and last two weeks of the semester to measure student learning in six competency areas:

- Basic muscular anatomical concepts (MAC)

- Algebra and graph reading skills (ALG)
- Neuromuscular function concepts (NFC)
- Kinematics (KIM)
- Kinetics (KIN)
- Fluid mechanics and application skills (FLA)

b. **Why was/were this/these artifact(s) chosen and how many?**

This test of biomechanics concepts was chosen because it has been shown to be valid, reliable, have national norms, and agree with the physics literature that many students have difficulty mastering Newtonian mechanical concepts (Knudson et al., 2003; Knudson, 2004).

c. **Who evaluated the artifact(s) and how?**

Dr. ChengTu Hsieh an international expert in sports biomechanics administered and scored the inventory.

d. **Was a rubric used?**

A standardized test was utilized (BCI3). This test was designed to address four pre-requisite and eight competencies based on national standards (NASPE Biomechanics Academy, 2003).

Student learning performance was analyzed in the following way: overall student performance on the pre-test compared to the post-test in each competency area. A normalizing gain (G) variable (g = (post-test score – pre-test score) / (maximum possible score – pre-test score)) was used to indicate students' normalized learning (Hake, 1998). In order to evaluate improvement in student learning from pre- to post-test, a paired t-test was performed.

Due to small number of questions for each competency area, these 24 questions were clustered into six major competency areas for the purposes of the present analysis: basic muscular anatomical concepts (MAC), algebra and graph reading skills (ALG), neuromuscular function concept (NFC), kinematics (KIM), kinetics (KIN), and fluid mechanics and application skills (FLA). Additionally, the percent correct response in each of the six competency areas were computed and compared to published values among introductory biomechanics students.

e. **What benchmark was chosen to demonstrate proficiency?**

A range of 13-29% normalized improvement in introductory biomechanics courses in the US has been recently reported (Hsieh & Knudson, 2018). However, rather than utilizing a range, the benchmark selected for this annual assessment report is the national norm figure of 17% normalized learning enhancement on the BCI3 exam when comparing pre and post scores (Hsieh, Mache, Knudson, 2014).

7. Assessment Results:

Please describe/report outcomes of assessment. How well did students perform on the task? What percentage of students met the benchmark? Were there significant differences in the ratings of the evaluators? If so, what might account for these difference? If students met the benchmark, what do they appear to be doing well and why? If students did not meet the benchmark, what are some possible reasons? You may use the table below to report results, adapting the table as necessary, but you should also provide a narrative describing and analyzing the assessment results.

Students (n = 24) performed significantly better on the post-test when compared to the pre-test (g = 0.142; $P <$ 0.061). Analysis indicated an overall 14.2% normalized learning enhancement which falls short of the 17% target (see Table 1), but within the low end of the previously described range of 13-29% improvement. The 14.2%

normalized learning enhancement for the current report does also fall short of the program data collected in Fall 2013 (N=51 in two Biomechanics KINE 322 courses) when we reported a 23% improvement.

Table 1. Overall Normalized Learning Enhancement Achievement

Student Learning Outcome	Sample and Sample Size	Did Scores Meet the Benchmark	Normalized Learning	Comparison to benchmark (17% normalized learning)
Overall Content Knowledge (Biomechanics)	24 undergraduate students in KINE 322	No	Overall normalized learning enhancement was **14.2%.**	Falls 2.8% short of the **17%** normalized learning enhancement benchmark.

An additional breakdown of the data has been provided (Table 2). First, analysis of pre and post test results indicates that the highest % of correct responses for both pre and post were in Muscular Anatomical Concepts (MAC), while the lowest % of pretest responses fell in Kinetics (KIN) and for posttest Fluid Mechanics and Application (FLA). Second, normalized improvement for each area indicated that there were statistically more students who exhibited gains in KIN (27.30% normalized improvement), Neuromuscular Function Concepts (NFC) (12.8%), and MAC (12.8%). Concepts with the least improvement included Algebra and Graph Reading Skills (ALG) (4.8%), Kinematics (KIM) (7.4%), and FLA (4.23%). Finally, percent correct response by category exceeded published post-test values (Hsieh, Mache, Knudson, 2014) for MAC, NFC, and KIM; while falling short in the areas of ALG, KIN, and FLA.

Table 2. Percent correct responses on pre- and post-test by concept. Published values (Hsieh & Knudson, 2018) were compared to current post-test percent correct responses.

N=24	MAC	ALG	NFC	KIM	KIN	FLA
Pre-Test	51.0%	48.6%	48.3%	44.2%	12.5%	26.0%
Post-Test	57.3%	51.0%	50.0%	48.3%	36.5%	29.2%
Percent correct post-test values compared to published post-test values	**+5.8%**	**-2.4%**	**+8.9%**	**+5.2%**	**-8%%**	**-12.6%**
Normalized Improvement	**12.80%**	**4.08%**	**12.90%**	**7.40%**	**27.30%**	**4.23%**

8. Planned Program Improvement Actions

Identify multiple, specific ways that the program can be improved on the basis of the assessment results. This could include curricular changes, changes to the learning outcomes themselves, new or modified assignments, course or program level standards established or modified, revised pedagogy, additional staffing or equipment needs, etc. How might these changes or improvements increase the percentage of students meeting the benchmark as well as the overall quality of the academic program?

These data will be used to initiate critical dialog among instructors of KINE 322 'Biomechanics' to determine specific program improvement actions. In particular, discussion of why students are achieving more favorable improvement in some areas (MAC, NFC and KIN) would be fruitful. Also important is why students are improving significantly less in ALG, KIM, and FLA. As part of this discussion, instructors will review and revise student learning outcomes paying special attention to those that address algebra, kinematics, and fluid mechanics and application skills. This

discussion will be guided by the national course guidelines and standards outlined here: https://www.shapeamerica.org/uploads/pdfs/2018/guidelines/Guidelines-for-UG-Biomechanics.pdf. Instructors will also discuss how course assignments and assessments align with student learning outcomes to ensure they adequately address all learning outcomes. Careful evaluation of student learning outcomes and design of course learning activities and assignments should help to improve overall learning and address the specific concept areas identified in this report as needing additional attention.

Results for the Exercise Physiology majors were similar to those in Kinesiology (Movement Studies and PETE), with a few exceptions. In fact, high and low performance reported in section 7 mirrors that of Kinesiology with a few notable exceptions. First, exercise physiology majors reported no negative values (i.e., did not regress in any category), whereas Kinesiology majors surprisingly showed regression in two categories (ALG, KIM). Second, exercise physiology reported healthy gains in MAC (12.8%), while Kinesiology showed only 4.34%. Finally, kinesiology reported an 18.4% gain in FLA while exercise physiology reported only a 4.23% gain.

	MAC	ALG	NFC	KIM	KIN	FLA
Exercise Physiology Majors (N=24) - Normalized Improvement	**12.80%**	**4.08%**	**12.90%**	**7.40%**	**27.30%**	**4.23%**
Kinesiology Majors (N=35) - Normalized Improvement	**4.34%**	**-2.90%**	**22.20%**	**-4.04%**	**19.60%**	**18.40%**

As part of an additional student success related project (Equity Minded Program Initiative) geared at reducing equity gaps, tutoring is no being offered for Kinesiology Department students enrolled in KINE 322 'Biomechanics'. While perhaps too early to determine, follow-up data collection and analysis may indicate the fidelity of tutoring in improving overall normalized learning as well as improvement in particular areas.

Finally, after reviewing data in this report as well as the performance of Kinesiology majors in this same course, instructors will begin dialog and increased attention in the areas with the lowest normalized improvement. As such, more intentional pedagogical focus, problem sets, and formative assessment will be placed on the areas of Algebra and Graph Reading Skills, Kinematics, and Fluid Mechanics and Application Skills.

9. Name, Title, and E-Mail Address of Person Completing this Form:

Kevin Patton__ - Professor; kpatton@csuchico.edu
Melissa Mache – current Kinesiology Chair; mmache@csuchico.edu

10. Acknowledgement and Signatures:

a) Department Chair: _____

Comments (if desired):

b) College Coordinator or Associate Dean (if applicable):

_____

Comments (if desired):

c) Dean or Associate Dean: _____

Comments (if desired):

II. Appendices (please include any of the following that are applicable to your program):

A. Rubric (exam)

Biomechanics Concept Inventory3 Date _____Name_____

Instructions: In the space provided mark the best possible answer.

____ 1. Rotating a limb away from the midline in the transverse plane is:

a. abduction c. internal rotation e. extension
b. adduction d. external rotation

____ 2. Anatomical structures toward the midline of the body are described as:

a. lateral c. caudal e. distal
b. medial d. anterior

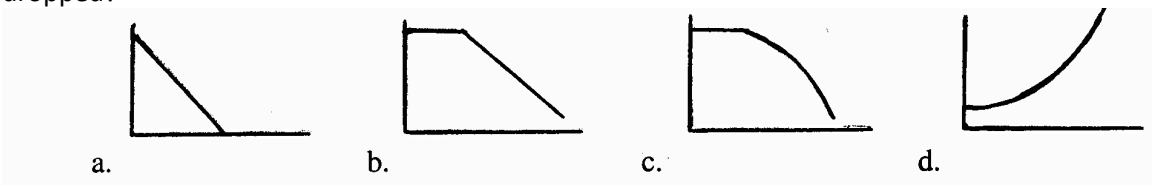
____ 3. The largest uniarticulate muscle that plantar flexes the ankle is the:

a. tibialis posterior c. biceps femoris e. anconeus
b. gastrocnemius d. soleus

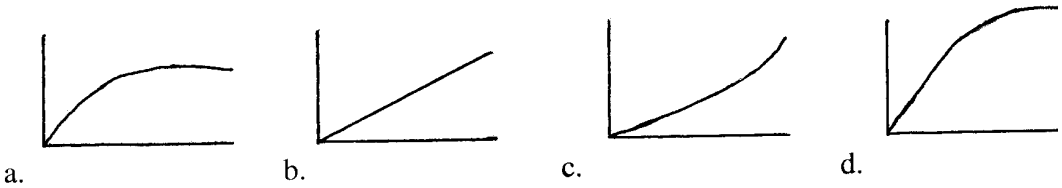
____ 4. The primary weight bearing bone of the lower leg is the:

a. femur c. fibula e. talus
b. tibia d. calcaneous

____ 5. Which of the following most accurately represents the vertical velocity of a golf ball held motionless and then dropped?



____ 6. Which of the following displacement-time graphs would result in the least displacement? Assume the displacement and time scales are identical.



____ 7. A person running 8 km/hour will run a 10 km race in about how many minutes?

a. 60 c. 80 e. not enough information
b. 75 d. 90

____ 8. A person's head, neck, and trunk make up about 60% of total body weight. How much do these body parts weigh in a 200-pound person?

a. 30 c. 120 e. not enough information
b. 60 d. 180

____ 9. A muscle shortening to overcome an external resistance is a ____ action.

a. concentric c. isometric e. isokinetic
b. eccentric d. isotonic

____ 10. The rise in passive tension of a muscle usually begins:
a. after activation
b. before activation
c. in shortened positions
d. in the midrange of motion
e. at the end of the range of motion

____ 11. The activation of different motor units in a muscle is called:
a. depolarization c. firing rate e. inhibition
b. rate coding d. recruitment

____ 12. Electromyography (EMG) is:
a. the electrical signal of nerve impulses
b. the amplification and recording of electrical signal of muscle
c. the electrical signal of a beating heart
d. a good measure of muscle force
e. only present in smooth muscle

____ 13. A swimmer with an average speed of 2 m/s will take about how many seconds to swim the length of a 50 meter pool?
a. 20 c. 30 e. 100
b. 25 d. 50

____ 14. With upward motion positive, what is the linear velocity of a person's center of mass in the countermovement of a vertical ump?
a. positive c. negative
b. zero d. not enough information to answer

____ 15. A person flexing their shoulder with a positive angular velocity will likely have what acceleration near the end of the range of motion?
a. zero c. positive
b. negative d. not enough information to answer

____ 16. In a sit-to-stand movement the trunk extends from a 45 degree (to the vertical) position up to vertical (0 degrees) in 0.5 seconds. What is the average angular velocity (in deg/sec) of trunk rotation?
a. -90 c. 0 e. 90
b. -45 d. 45

____ 17. How much does a 90 kg astronaut weigh (in Newtons) in orbit if earths gravity were measured at -0.01 m/s/s?
a. -9000
b. -90
c. -9
d. -0.9
e. not enough information to answer

____ 18. The peak force acting on the feet in landing can be decreased by
a. decreasing momentum c. increasing impulse
b. decreasing time of landing d. increasing time of landing

e. making leg joints more stiff

____ 19. Lifting heavy objects close to the body is important to protect the lower back because:
a. the moment arm for the weight of the object decreases
b. the arms are used more
c. the torque created by gravity increases
d. the back muscles angle of pull is improved
e. it equalizes forces on both sides of the body

____ 20. A 180 lb diver stands at the edge of a diving board 5 feet from the support under the board. Ignoring the mass and bending of the board, what is size of the gravitational torque created by the diver's body?
a. 0 c. 36 e. 900
b. 28 d. 92

____ 21. The fluid force that tends to create flotation of objects in a fluid is:
a. Magnus c. buoyancy e. lift
b. drag d. centripetal

____ 22. Increasing the roughness on an object moving through a fluid is beneficial in:
a. decreasing drag
b. increasing lift on spinning spheres
c. decreasing Magnus forces
d. increasing buoyancy
e. decreasing buoyancy

____ 23. An exercise leader selected bent-leg (small knee flexion) calf muscle group stretches over straight-leg stretches because:
a. this increases the passive torque in the calf muscles
b. this focuses more stress on the gastrocnemius
c. this increases stress in the knee joint capsule
d. this focuses more stress on the soleus
e. not enough information to answer

____ 24. A softball coach used cues to have her infielder's reach forward more in fielding ground balls because:
a. it increased the impulse they could apply to the ball
b. it minimized the time to slow down the ball
c. it improved the fielder's balance
d. it would intercept the ball with less kinetic energy
e. it increased the time and distance the ball could be slowed down

B. Data Analysis

Overall comparison of pre and post scores for Exercise Physiology undergraduates :

Post-Test		**Pre-Test**	
Mean	12.125	Mean	10.16667
Standard Error	0.754965	Standard Error	0.685425
Median	12	Median	10
Mode	10	Mode	10
Standard Deviation	3.69856	Standard Deviation	3.357881
Sample Variance	13.67935	Sample Variance	11.27536
Kurtosis	-0.00383	Kurtosis	1.935754
Skewness	0.634646	Skewness	1.022524
Range	15	Range	15
Minimum	6	Minimum	5
Maximum	21	Maximum	20
Sum	291	Sum	244
Count	24	Count	24
t-Test: Two-Sample Assuming Equal Variances			
	Variable 1	Variable 2	
Mean	12.125	10.16667	
Variance	13.67935	11.27536	
Observations	24	24	
Pooled Variance	12.47736		
Hypothesized Mean Difference	0		
df	46		
t Stat	1.920507		
P(T<=t) one-tail	0.030503		
t Critical one-tail	1.67866		
P(T<=t) two-tail	0.061006		
t Critical two-tail	2.012896		
g =	0.141566		
Normalized improvement =			0.142

References

Hsieh, C., Mache, M. A., & Knudson, D. (2014). Students' learning of specific biomechanical competencies. Conference: 32nd Conference of the International Society of Biomechanics in Sports At: Johnson City, TN Volume: 32

Hsieh, C., & Knudson, D. (2018). Important learning factors in high- and low-achieving students in undergraduate biomechanics. *Sports Biomechanics, 17*(3), 361-370.

Knudson, D., Noffal, G., Bauer, J., McGinnis, P., Bird, M., Chow, J., Bahamonde, R., Blackwell, J., Strohmeyer, S., & Abendroth-Smith, J. (2003). Development and evaluation of a biomechanics concept inventory. *Sports Biomechanics*, *2*, 267–277.

Please submit completed reports electronically to your dean, associate dean, and/or college assessment coordinator by 9/30/XX.

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