A PROPOSAL TO THE GFCB STRATEGIC PLANNING COUNCIL SEEKING SPC SUPPORT FOR THE FORMATION OF A COMMITTEE TO STUDY WHETHER LATER CLASS START TIMES AT WKU MIGHT IMPROVE STUDENT SUCCESS AND RETENTION AT WKU, AND, IF SO, HOW TO BEST EFFECT SUCH CHANGES

A growing body of academic research indicates that, on average, college students' sleep times are shifted two-three hours later – at least for students in their late teens and early 20's. Because these changes in circadian timing conflict with early starts for many university classes, sleep deprivation in college students is increased. Sleep deprivation damages physical and emotional well-being and impairs cognition and performance. Sleep loss or mistimed sleep are associated with increased risk of metabolic disorders, obesity, and diabetes, as well as with depression, anxiety, and drug use, poorer attention, performance, and memory consolidation**.**

If students can achieve longer sleep and better sleep quality, it is hypothesized that significant improvements can be made in student success – whether measured by GPA, student retention rates, or other measures.

Possible solutions to the problem of persistent college student sleep deprivation (estimated to affect up to 60% of all college students) may be either:

(1) adopting later class start times for all classes (with no class beginning prior to 9am or 10am or even 11am); or

(2) offering fewer classes with early (8am, 9am, 10am) class times and more classes with later (11am or later) start times.

A related solution might include enhancing the education of WKU students early on in their college life regarding chromotypes, sleep quantity, and sleep quality, and the consequences of sleep deprivation. Additional education for faculty, academic advisors, and staff may also be beneficial.

There appear to be approximately 1,750 students enrolled in WKU Colonnade courses, in the Fall 2017 semester, that begin at 8:00 a.m. Since freshmen and sophomores take most of these courses, this might be an area to focus upon, as to increasing student retention and success. Of course, many, many more students are enrolled in classes that begin at 9:00 a.m., which some academic research suggests is still far too early for many traditional college students.

It must be emphasized that the issue is not whether students learn effectively in such early a.m. classes; we have many professors who are highly capable of holding students' attention during the early morning hours. Rather, the issue is whether a later start time would benefit, on average, students in many aspects – attention spans during all classes during the day, increased retention, better average GPAs, better mental health, etc.

Despite a 2011 study indicating a "significant positive effect on student achievement, which is roughly equivalent to raising teacher quality by one standard deviation" with a 50-minute later start time at the Air Force Academy (which, admittedly, has a different college schedule and environment than most universities), there has not been a widespread movement by colleges and universities to adopt later class start times. Accordingly, a review of the academic literature is in order, as well as outreach to other institutions who may have studied these issues. (*A brief summary of the academic literature is provided*

herein as Exhibit A. A much more in-depth review, with faculty knowledgeable about these and related health and wellness issues, would be desired.)

Given the potential for dramatic improvements in student success measures should later class start times be found to result in a likely significant reduction in student sleep deprivation, would the GFCB SPC endorse presenting recommendations to the GFCB Administration, the WKU Administration, and/or the Faculty Senate, of the following:

(1) First, the formation of a faculty and staff committee to review the academic literature in this area, with the goal of determining the likelihood of a positive impact of scheduling later class start times. The involvement of faculty with a background in the areas of science involved by these issues would likely be helpful.

(2) Second, if the committee finds a significant probable positive impact, the committee might then suggest the possible methods for effecting changes to college start times, and how to best involve other stakeholders in the plans for any desired changes. Further steps might include:
    a. The committee itself, or a separately formed committee, might seek to ascertain how the scheduling of courses would be affected by the recommended changes.
    b. Armed with knowledge of the course schedule changes, input from various stakeholders could be sought, including but not limited to:
        i. Students
        ii. Faculty
        iii. Counseling Services
        iv. Academic Advisors
        v. Staff
        vi. Facilities
        vii. Athletics
        viii. Other staff
        ix. Student activities and organizations
        x. Student residence life
        xi. WKU Police Department
        xii. Employers of students
        xiii. Bowling Green business community
        xiv. Bowling Green government
        xv. Etc.

(3) Finally, a final report might be furnished by the committee to the GFCB (or, if done campus-wide, to the WKU Administration and to the Faculty Senate), summarizing the input from various stakeholders and containing a cost / benefit analysis, with final recommendations. Thereafter the various constituencies could consider whether to implement all or some of the recommendations.

Thank you.
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APPENDIX A
OBSERVATIONS FROM RECENT ACADEMIC LITERATURE

Identifying the Best Times for Cognitive Functioning Using New Methods: Matching University Times to Undergraduate Chronotypes. M. D. R. Evans, Paul Kelley and Jonathan Kelley. University days generally start at fixed times in the morning, often early morning, without regard to optimal functioning times for students with different chronotypes. Research has shown that later starting times are crucial to high school students' sleep, health, and performance. Shifting the focus to university, this study used two new approaches to determine ranges of start times that optimize cognitive functioning for undergraduates. The first is a survey-based, empirical model (SM), and the second a neuroscience-based, theoretical model (NM). The SM focused on students' self-reported chronotype and times they feel at their best. Using this approach, data from 190 mostly first and second year university students were collected and analyzed to determine optimal times when cognitive performance can be expected to be at its peak. The NM synthesized research in sleep, circadian neuroscience, sleep deprivation's impact on cognition, and practical considerations to create a generalized solution to determine the best learning hours. Strikingly the SM and NM results align with each other and **confirm other recent research in indicating later start times**. They **add several important points: (1) They extend our understanding by showing that much later starting times (after 11 a.m. or 12 noon) are optimal; (2) Every single start time disadvantages one or more chronotypes; and (3) The best practical model may involve three alternative starting times with one afternoon shared session**.

Excerpts:

Despite an impressive, cumulating body of medical and educational research evidence consistently indicating that later start times improved educational performance (Borlase et al., 2013; Edwards, 2012; Meltzer et al., 2014; Wahlstrom et al., 2014), there has been little change in educational starting times.

The crux of the matter in the temporal misalignment problem is that biological changes beginning in puberty shift wake and sleep times 2–3 h later in the day. This shift is at its greatest at age 19 (Roenneberg et al., 2004) before reverting to an earlier pattern in the mid-20s. Oblivious to these changes, secondary schools and universities continue to start classes early in the morning.

Genetic factors lead to variations in circadian timing of ±4 h from the mean, as well as differences by age and by sex. For instance, **the shift in adolescent circadian timings to 2–3 h later begins earlier in females and reaches its peak at 19.5 years, whereas it is 20.9 in males** (Roenneberg et al., 2004).

Because these changes in circadian timing conflict with early starts in school and university, sleep deprivation increases rapidly with age (Roenneberg et al., 2007). More generally, prior research shows that **sleep deprivation damages physical and emotional well-being and impairs cognition and performance** (Lockley et al., 2004; Blakemore and Choudhury, 2006). Sleep loss or mistimed sleep are associated with increased risk of metabolic disorders, obesity, and diabetes (Buxton et al., 2012; Luyster et al., 2012); depression, anxiety, and drug use (Preckel et al., 2013); and poorer attention, performance, and memory consolidation (Goldstein et al., 2007).

Compared to the growing body of evidence on secondary schools, **studies of university start times are relatively rare despite the demonstrated importance of later times for optimal academic performance** (Matchock and Mordkoff, 2009; Carrell et al., 2011; Hsu et al., 2012). Findings to date reveal that undergraduates also have working hours that begin too early and so incur the same risks as high school students. The biological mechanisms for these risks can be remarkably rapid. In a single week with <6 h sleep, subjects aged 27.5 ± 4.3 y showed changes in metabolic, immune, inflammatory and stress responses, gene expression, alertness and performance (Möller-Levet et al., 2013). Sleep disruption also can impair specific cognitive functions such as working memory (Lo et al., 2012). A recent functional magnetic resonance imaging (fMRI) study (Muto et al., 2016) demonstrated that cortical responses showed significant circadian rhythmicity, the phase of which varied across brain regions. Moreover, subjects (17 men, 16 women; aged 21.1 ± 1.7 y) showed local modulation of cerebral circadian phase in cognitive functions in responses to task-related requirements such as attention and working memory.

In general, students do not feel at their best in the early morning hours. On a scale of 0–100, the average student rated 5 a.m. very low, just under 20 points out of 100 (see Figure 1). This is the nadir of the day. The standard deviation is very wide, but even students whose ratings are a full standard deviation above the group as a whole only rate 5 a.m. in the low 40s. Ratings then rise as the morning wears on, but by the start of many typical working days (8:30 a.m.), the average rating is only about 40 points out of 100, well below more optimal start times with ratings just over 70.

As the clock runs forward, students move toward their peak. They reach a neutral point around 9 a.m., and then begin to move into the positive performance zone. **At around 11 a.m. students reach the beginning of a long slightly irregular optimal performance plateau which elicits mean ratings between about 70 and about 74. The plateau comes to an end between 9 p.m. and 10 p.m**. perhaps reflecting the WMZ with a steep decline thereafter. Ratings drop to the neutral point of 50 around 11 p.m. down into the 30s by about midnight, and down into the 20s around 2 a.m.

These means reveal several important points about when students feel "at their best":

> (1) The peak performance spell starts around 11 a.m. or 12 noon. This is much later than the beginning of the standard workday. This is also much later than many undergraduate classes start.
>
> (2) The peak performance spell (the high plateau in the graph) is quite long and extends well into the evening—much later than classes typically run.
>
> (3) An irregularity in the long plateau is the slight "two-humped" shape, or bimodal distribution. Such a distribution typically indicates that there are at least two groups with different peaks in the data, an issue to which we return, below, when we look at subjective optimality over the course of the day for subjects with different chronotypes. It does *not* reflect bi-phasic optima for individuals, although it does not rule them out.
>
> (4) **A usual 9 to 5 workday (shaded area in the graph) begins far too early to be optimal for students, starting when most of them are feeling far from their best.**

Starting two, three, or even 4 h later would be much better at the beginning of the work day and still come to an end well within the long peak performance plateau.

But time is not a "one size fits all" phenomenon: Students' self-ratings of performance are diverse at all times of day. Yet the degree of dispersion is not uniform. The dispersion of performance ratings is narrowest—25 points out of 100 or less -during the long high plateau of peak performance from about 11 a.m. till about 9:30 p.m. The dispersion is at its widest—28 points out of 100 or more—in the fairly early morning, 7 a.m. till about 10 a.m. and then again late at night, about 11 p.m. till 2 a.m.

Later school start times in the U.S.: An economic analysis, by Marco Hafner, Martin Stepanek, Wendy M. Troxel. RAND corporation report (2017) – available at https://www.rand.org/pubs/research_reports/RR2109.html. Explores the economic benefits of later start times for classes, including having later start times in college aid in college graduation rates, increased GPAs, student mental health, decreased drinking, and with economic benefits extending to students' lifelong learnings. While the report focuses on high schools, some observations are made with respect to college class starting times. The report notes other academic literature that suggests students' circadian rhythms remain shifted late until about age 24.

Sleep and Academic Performance in Undergraduates: A Multi-measure, Multi-predictor Approach. Gomes, Ana Allen; Tavares, Jos; de Azevedo, Maria Helena P. Chronobiology International: The Journal of Biological & Medical Rhythm Research. Nov2011, Vol. 28 Issue 9, p786-801. 16p. Abstract: The present study examined the associations of sleep patterns with multiple measures of academic achievement of undergraduate university students and tested whether sleep variables emerged as significant predictors of subsequent academic performance when other potential predictors, such as class attendance, time devoted to study, and substance use are considered. A sample of 1654 (55%% female) full-time undergraduates 17 to 25 yrs of age responded to a self-response questionnaire on sleep, academics, lifestyle, and well-being that was administered at the middle of the semester. In addition to self-reported measures of academic performance, a final grade for each student was collected at the end of the semester. Univariate analyses found that **sleep phase, morningness//eveningness preference, sleep deprivation, sleep quality, and sleep irregularity were significantly associated with at least two academic performance measures.** Among 15 potential predictors, stepwise multiple regression **analysis identified 5 significant predictors of end-of-semester marks: previous academic achievement, class attendance, sufficient sleep, night outings, and sleep quality** (R2 == 0.14 and adjusted R2 == 0.14, F(5, 1234) == 40.99, p < .0001). Associations between academic achievement and the remaining sleep variables as well as the academic, well-being, and lifestyle variables lost significance in stepwise regression. **Together with class attendance, night outings, and previous academic achievement, self-reported sleep quality and self-reported frequency of sufficient sleep were among the main predictors of academic performance, adding an independent and significant contribution, regardless of academic variables and lifestyles of the students**.

Class Start Times, Sleep, and Academic Performance in College: A Path Analysis. Onyper, Serge V.; Thacher, Pamela V.; Gilbert, Jack W.; Gradess, Samuel G. Chronobiology International: The Journal of Biological & Medical Rhythm Research. Apr2012, Vol. 29 Issue 3, p318-335. 18p. 2 Diagrams, 7 Charts. Abstract: Path analysis was used to examine the relationship between class start times, sleep, circadian preference, and academic performance in college-aged adults. **Consistent with observations in middle and high school students, college students with later class start times slept longer, experienced less daytime sleepiness, and were less likely to miss class**. Chronotype was an important moderator

of sleep schedules and daytime functioning; those with morning preference went to bed and woke up earlier and functioned better throughout the day. **The benefits of taking later classes did not extend to academic performance, however; grades were somewhat lower in students with predominantly late class schedules. Furthermore, students taking later classes were at greater risk for increased alcohol consumption, and among all the factors affecting academic performance, alcohol misuse exerted the strongest effect**. Thus, these results indicate that later class start times in college, while allowing for more sleep, also increase the likelihood of alcohol misuse, ultimately impeding academic success

Sleep Quality and Academic Performance in University Students: A Wake-Up Call for College Psychologists. Gilbert, Steven P.; Weaver, Cameron C. Journal of College Student Psychotherapy. Oct-Dec2010, Vol. 24 Issue 4, p295-306. 12p. 1 Chart. Abstract: Both **sleep deprivation and poor sleep quality are prominent in American society, especially in college student populations**. Sleep problems are often a **primary disorder** rather than secondary to depression. The purpose of the present study was to determine if sleep deprivation and/or poor sleep quality in a sample of nondepressed university students was associated with lower academic performance. A significant negative correlation between Global Sleep Quality score (GSQ) on the Pittsburgh Sleep Quality Index and grade point average supports the hypothesis that **poor sleep quality is associated with lower academic performance** for nondepressed students. Implications for both the remedial (assessment and treatment) and preventive (outreach) work of college and university counseling centers is discussed

Lopes, E.; Milheiro, I.; Maia, A. Sleep Medicine. Dec2013 Supplement, Vol. 14, pe185-e185. 1p. Abstract: Introduction: **Sleep assumes a major role in human functioning.** The aim of this study was to describe features concerning sleep quality, lifestyle, general well-being and academic satisfaction/ performance in college students; characterize the relationship between sleep quality and several aspects related to lifestyle, levels of personal/social well-being and academic performance/satisfaction and to identify predictive factors of poor sleep quality in this population … From the assessed students, **64.8% presented poor sleep quality. An association was found between those subjects and lower levels of academic success and satisfaction, worse adaptation to scholastic demands, worse opinion about conditions of the place where sleep occurs, more physical and psychological symptoms, learning problems, daily and academic organization problems and poorer relationships with peers and intimate relationships.** Logistic regression analyses identified smoking habits and caffeine intake, a higher punctuation on "Symptoms/difficulties/problems" index and less satisfaction with life and support received from social relationships as predictors of poor sleep quality.

An Analysis Of The Sleep Quality Of Undergraduate Students. Carter, Briana; Chopak-Foss, Joanne; Punungwe, Fadzai B. College Student Journal. Fall2016, Vol. 50 Issue 3, p315-322. 8p. Abstract: Background and Aims: The purpose of this study was to measure the sleep quality of a sample of **undergraduate students** and compare it to the recommendations for young adults from the National Sleep Foundation. A sample of undergraduate students from a midsized public university in the Southeast were recruited for this study (N=86). The Pittsburgh Sleep Quality Index (PSQI) was employed to assess sleep quality of the students. Results: Frequency analysis found that **most students did not get the minimum amount of sleep as recommended by the National Sleep Foundatio**n. A nonparametric correlation (listwise) analysis found a positive correlation on four of the six elements of the PSQI. Conclusion: **College student populations could**

benefit from health education programs that address the effects of sleep deprivation and offers tips on good sleep hygiene.

loss, Jacqueline D.; Nash, Christina O.; Walsh, Colleen M.; Culnan, Elizabeth; Horsey, Sarah; Sexton-Radek, Kathy. Behavioral Medicine. Jan-Mar2016, Vol. 42 Issue 1, p48-56. 9p. Sensitizing young adults about sleep hygiene knowledge and helpful sleep attitudes may have the potential to instill long-lasting healthy sleep practices. Towards these ends, evaluation of **psychoeducational program "Sleep 101" tailored to college students was undertaken**. Following two weeks of sleep-log recordings, participants were randomly assigned to a Sleep 101 (experimental) condition or a sleep monitoring (control) condition. The Sleep 101 condition was comprised of two 90-minute workshops aimed to educate students about healthy sleep practices, helpful thoughts about sleep, and ways to improve sleep. The sleep monitoring group received a sleep hygiene handout and completed sleep logs for the study duration. **Sleep 101 participants endorsed fewer maladaptive beliefs and attitudes about sleep, increased sleep hygiene knowledge, and reduced sleep onset latency compared to the sleep monitoring participants. Brief psychoeducational courses may be a cost-effective way to alleviate current, and/or prevent future, sleep problems in young adults**.

Revving Up And Staying Up: Energy Drink Use Associated With Anxiety And Sleep Quality In A College Sample. Stasio, Michael J.; Curry, Kim; Wagener, Alexandra L.; Glassman, Destinee M. College Student Journal. Dec2011, Vol. 45 Issue 4, p738-748. 11p. Abstract: Associations among caffeinated energy drink use, anxiety, and sleep quality were examined in a young adult sample (TV = 107). A 7-day retrospective survey methodology was used to assess consumption rates among college student athletes, ROTC cadets, and those in a control group. Regression analyses revealed that **energy drink use explained 29% of the variance in anxiety scores and 20% in sleep disturbance score**s. Greater frequency of energy drink use was associated with poorer sleep quality, longer sleep latency, shorter sleep duration, and lower habitual sleep efficiency.

The young and the restless: Socializing trumps sleep, fear of missing out, and technological distractions in first-year college students. Adams, Sue K.; Williford, Desireé N.; Vaccaro, Annemarie; Kisler, Tiffani S.; Francis, Alyssa; Newman, Barbara. International Journal of Adolescence & Youth. Sep2017, Vol. 22 Issue 3, p337-348. 12p. Abstract: College students are a sleep-deprived population, with **first year students facing a number of specific challenges to sleep**. As students transition into and through the first year of college, sleep may be sacrificed for a variety of reasons. Semi-structured interviews were conducted with fifteen first-year students, exploring factors that impacted sleep during the first semester of college. **Study participants identified three unique but related themes that impacted their sleep: socializing trumps sleep; fear of missing out; and social/technological distractions**. Implications are provided for balancing social, academic and biological demands in emerging adulthood.

Lau, Esther Yuet Ying; Wong, Mark Lawrence; Ng, Eddie Chi Wai; Hui, Chi-chiu Harry; Cheung, Shu Fai; Mok, Doris Shui Ying. Chronobiology International: The Journal of Biological & Medical Rhythm Research. Aug2013, Vol. 30 Issue 7, p910-918. 9p. 3 Charts, 6 Graphs. Abstract: Although on-campus residence allows easier access to campus facilities, existing studies showed mixed results regarding the relationship between college residence and students' well-being indicators, such as sleep behaviors and mood. There was also a lack of studies investigating the role of chronotype in the relationship between on-campus residence and well-being … Although students living on campus differ in their chronotypes, **activities in campus residence (if any) are mostly scheduled in the nighttime ... morning-type**

campus residents had worse well-being than other campus residents and they were more likely to discontinue living on campus after one semester. Our findings bear practical significance to college management that **morning-type campus residents are shown to be experiencing deteriorating well-being**. The authorities **may need to review and revise the room-allocation policy in campus residence** in improving the well-being among campus residents.

Chronotype, class times, and academic achievement of university students. Enright, Tristan; Refinetti, Roberto. Chronobiology International: The Journal of Biological & Medical Rhythm Research. May2017, Vol. 34 Issue 4, p445-450. 6p. Abstract: Numerous studies over the years have documented an effect of human chronotypes on physiological and psychological processes. Studies evaluating the impact of an individual's chronotype on his/her academic achievement have indicated that morning chronotypes have an academic advantage over evening chronotypes. However, these studies did not account for the time of day in which the participants were being evaluated. The goal of the present study was to examine whether morning chronotypes do have an academic advantage over evening chronotypes when the time of day of classes and exams is taken into consideration. We obtained morningness–eveningness scores and course grades from 207 university students who took classes (and exams) at different times of the day. We confirmed that **morning chronotypes attain better grades than evening chronotypes, although the association is weak** (r2= 0.02). The difference persisted even after the time of day of classes and exams was taken into consideration. This is probably due to the fact that **evening chronotypes are generally more sleep deprived than morning chronotypes as a result of the early schedule of most schools, which can impair their performance both early and late in the day**.