TOO MUCH LEARNING AND TEACHING?

BENEFITS AND DRAWBACKS OF INTENSIVE ACADEMIC PROGRAMS

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CONTEXT

Between 1961 and 2003, the time students spend on learning outside the classroom decreased from about 24 to 14 hours per week[1] (40 and 27 respectively if including class time[2]). A 2019 study that asked students to record their daily learning activities over a five-month period found that students spent on average about 20 hours including both lecture and independent study. The authors argue that many studies overestimate how much time students spend because they rely on one retrospective measure.[3] Accreditation assumes 30 hours of independent work given 10 hours of lecture and thus the average student was not meeting the required hours in 1961 and is a long way off today. These changes are comparable across disciplines, work hours, and parent education levels. Thus, many scholars argue these changes are mostly due to lower achievement standards. Faculty commonly argue that standards have dropped because of lower student aptitude compared to before—due to increased diversity of students—and that students spend more time working than before. Yet, while there is evidence to support the former,[4] the latter is at least not universal given evidence showing that those who work and don't work spend similar time on independent study. At the same time graduation rates have increased and grades are inflated.[5,6] These two trends seem to be mostly due to relaxed standards.[5] Taken together, more students are graduating with higher grades despite greater heterogeneity of students who across the board spend less time studying. Whether and how to reverse these trends is of interest to policy makers, university leaders, and faculty.

EXECUTIVE SUMMARY

Purpose. This report reviews research about the benefits and drawbacks of "intensive" teaching and learning. Does raising standards and demanding more effort from students have meaningful benefits and/or serious consequences? What kinds of changes at the student, course, and curriculum levels lead to higher standards and increased effort? Several universities are experimenting with what is sometimes referred to as "block mode teaching" (BMT) or "intensive mode delivery" (IMD) where students focus on fewer topics at a time for shorter periods. These explorations, including at Duke Kunshan University, are motivated by theoretical, practical, and empirical findings suggesting that intensive teaching can a) improve learning, b) close inequity gaps, c) offer greater scheduling flexibility, and d) better fulfill the educational needs of non-traditional groups (e.g. first-in-family and lifelong learning). Scholars also argue moving to a block mode teaching can help address concerns around e) decreasing standards across many disciplines ("when I did my undergraduate degree, requirements were more challenging") and f) students spending less time studying (see above). Conversely, others argue that intensive teaching can g) have negative effects on mental health, h) limit deep engagement and reflection, i) promote group assessment (raising concerns about free riding), and/or j) cause overload (workload or cognitive load).

Findings. Despite growing interest and optimism, the study of intensity in teaching and learning is still limited. In a special issue on intensive teaching and learning published in 2024, the literature on BMT was described as "immature and evolving."[7] Mitchell and Brodmerkel in a review of research on "highly intensive teaching" in higher education said that "despite the increasing popularity of this form of delivery, rigorous and methodologically robust research into the benefits and challenges of this form of pedagogy is still in its infancy."[8] One reason is that relatively few institutions use BMT, IMD, and/or emphasize intensive teaching. Another is that many BMT/IMD courses and programs attract a different student body, making comparisons difficult. Implementation of intensive teaching also often coincides with other pedagogical development. As a result, evaluating whether effects are due to *intensity* or *pedagogy* can be difficult. Finally, very few studies include a broad range of reliable and valid measures of learning outcomes (e.g. authentic assessment).

The current evidence suggests that intensive learning can improve academic performance, advance equity, reduce failing rates, enhance satisfaction, improve stress management and increase positive stress (eustress), and strengthen study habits. However, research also reports that increased rigor can lead to cognitive overload, superficial learning, increased stress, less satisfaction, and burnout. Other studies reveal minimal differences across modes of teaching. On balance, more studies report benefits of intensive learning compared to drawbacks. Taken together, the results suggest that the effects of intensive learning are moderated by students' motivation and learning skills, how well course activities are linked to learning outcomes, and whether said outcomes are scaffolded across courses in the curriculum. Thus, *increasing* intensity should be accompanied by metacognitive training, pedagogical redesign promoting deep learning and higher-level skill training, curricular scaffolding, and mental health monitoring and support.

INTRODUCTION

What is Intensive Teaching and Learning?

This report centers on "intensity," broadly defined as full-time, focused, and/or challenging learning. Sometimes scholars use the terms "intensive" and "rigorous" interchangeably as there is no strong consensus in higher education on how to define these concepts. Commonly intensity encompasses multiple dimensions which are often studied separately: compressed timeframe, workload, cognitive load, level of learning (e.g. Bloom's taxonomy), self-perception, and focus.

Workload refers to the hours required to complete the tasks assigned and achieve learning objectives. Because students spend most of their time outside the classroom, how many hours are required depends on how effective and efficient students' learning approaches are, which in turn can depend on course design, prior knowledge, and metacognition. Some courses might have an unreasonable workload—i.e. well-prepared students with strong learning skills and habits (metacognition) are not able to complete tasks and reach objectives, even in a course that is their sole focus. Workload can also be an issue of curricular design if requirements across courses are not manageable. In many countries, students also spend significant time on extracurricular activities which can lead to an overwhelming workload.

Cognitive load measures the mental effort of learning experienced by each student.[a] Scholars and empirical evidence suggests there are three types[b] of cognitive load.[9]

a) Extraneous Cognitive Load (ECL): accessibility and/or quality of the description of the object of study, learning approaches, and outcomes.
b) Intrinsic Cognitive Load (ICL): a) the complexity of, and b) familiarity with, the object of study.
c) Germane Cognitive Load (GCL): mental approach to process and schematize information and/or train skills.

Courses with unclear standards and outcomes, inaccessible explanations, and ineffective learning activities increase ECL. Students spend too much time and effort trying to figure out what they are supposed to do, and lectures or activities are not very helpful. ICL is the

inherent complexity of the course's topic. Many university courses have pre-requisites because scaffolding is necessary to manage ICL. Finally, GCL is what students do to integrate information and/or apply skills. While we generally want to maximize GCL effort, students might feel overwhelmed if asked to apply a complex framework to a real-world problem. Each of the three, or combined, can lead to a cognitive "overload," i.e. the inability to build understanding or acquire skills. Ideally, teachers want to minimize ECL and optimize ICL and GCL. Optimizing ICL requires that faculty design accessible materials for complex topics and a curriculum that ensures the necessary scaffolding. Faculty can also impact GCL by employing effective and efficient learning activities in and outside of class sessions. Nevertheless, many scholars argue independent learning habits and skills are important to reduce and manage cognitive load. Strong metacognition can help optimize GCL and increase the threshold for ICL and ECL. Cognitive load is measured using both physiological and subjective instruments.[10]

Educators generally agree that, ultimately, students should reach higher levels of performance and skills, measured using e.g. the **Bloom's taxonomy**. Learning can be challenging at all levels, but higher levels, on average, require more effort and demand a greater cognitive load. Especially without carefully planned scaffolding. However, more recently scholars disagree to what extent such taxonomies are hierarchical, i.e. how much scaffolding is needed. Some argue that it is not necessary to teach lower-level skills first, and that the only way to train higher level skills and more complex knowledge is to jump right in. If so, it seems more efficient to teach lower-level skills at the same time as higher-level skills.

Education scientists also study how students **perceive intensity and rigor** and whether it relates to behavior and outcomes. Studies suggest significant variation in self-perception of intensity across students and levels of experience. They also reveal that students think of rigorous learning and teaching as being multi-faceted. Finally, studies have documented the relationship between self-perception of rigor and course evaluation as well as course grades.

"Block mode teaching" and "intensive mode delivery" center on students attending one (or few) courses at a time to allow for greater **focus** on a topic/subject. Scholars do not agree on a single definition. The central idea is that students *focus* on one or fewer subjects over a shorter period compared to traditional modes of delivery (TMD). Theoretically, BMT and IMD do *not* have to be intensive as measured using the definitions above, but empirically

that is a likely outcome when moving to a "compressed" format. Implementation of BMT and IMD varies greatly, from 6-8 hour sessions over a few days, to shorter daily sessions over a few weeks (commonly 3-7). Duke Kunshan University employs four 7-week sessions with five hours of contact time per week. Sometimes, IMD is an integrated part of traditional 14-week schedules. For example, at Bond University, twice per semester students participate in three day intensive 6 hour face-to-face sessions.[8]

Why Intensive Teaching and Learning?

Universities adopt intensive teaching schedules and faculty use rigorous pedagogical approaches for theoretical, practical, and fairness reasons. One prominent motive for adopting modes of intensive teaching is to enhance students' focus and reduce the probability of cognitive overload. This is based on the theory that it is more effective to learn one (or few) things at a time. Research on e.g. media multitasking is relatively conclusive: tasks take longer and yield less learning.[11–13] Whether short-term multitasking applies to learning across 3-4 courses compared to 1-2 is less clear (see discussion below). Indeed, that question is at the heart of research that compares BMT and traditional delivery of courses. Whether students learn more when their studies are focused. Relatedly, some might argue that taking fewer courses at a time might reduce proportion of courses that students don't put much effort into, because student's don't divide their time equally between courses. Furthermore, minimizing distractions might be particularly helpful for disadvantaged students who often have more external disruptions including work, family care, stress etc. Theory suggests that greater focus can increase commitment, as students have fewer opportunities to focus on favorite courses *and* are less likely to experience cognitive overload.

Another pedagogical argument in favor of intensive learning is that longer and/or more frequent sessions allow for more engaging learning activities. Intermittent short sessions (e.g. an hour once or twice per week) simply can't facilitate e.g. project- or group-based learning activities nor comprehensive workshops for complex problem-solving tasks.[8]

Some argue that students learn less when the level of learning is not challenging enough. That the optimal learning level is "intensive." Studies suggest that a challenging cognitive load can increase motivation which in turn leads to improved learning (see discussion

below). Furthermore, emerging research on gifted students suggests that not being challenged at early stages leads to underperformance in the future. An easy level develops bad learning habits. Consequently, when faced with challenging tasks students' self-confidence drops off a cliff because they're used to coasting through.[14]

In some places, governments promote alternative modes of teaching to make higher education more accessible to underrepresented groups, e.g. indigenous, those with disability, people from remote areas, and/or with a low socioeconomic status. Many of these groups can only commit to part-time schedules alongside work or social obligations. Compressed courses can be an attractive option for non-traditional student.[15]

Relatedly, many universities opt to offer a broad range of education options to fund their operations. Faced with decreasing public funding, some universities have responded by offering short courses for people who seek professional development or are interested in lifelong learning. Unsurprisingly, some argue that universities are primarily attending to demands from prospective students rather than "for any reasons of quality pedagogy."[8] Shorter courses can be cost-effective, and convenient, where part-time lecturers deliver courses in a few days or weeks. Especially when universities hire professionals instead of academics to teach courses.

Lastly, and less prominently, some might argue that BMT offers more flexibility to organize faculty and staff schedules. For example, BMT can allow faculty to overload their teaching in shorter sessions, reserving space and opportunity to do research or service during other sessions. In a format where there are four sessions instead of two during the academic year, faculty can focus on teaching for two sessions and have two sessions off. In the traditional format it is more challenging to teach four courses in one semester.

REVIEW OF RESEARCH ON INTENSIVE LEARNING AND TEACHING

Self-Perception

One study of self-perceived academic rigor suggests large variation across students and that students commonly conflate e.g. intensity, workload, cognitive load, faculty support, lack of preparation, misaligned assessment and content, quick pace, fairness, quality of teaching, and learning outcomes.[16,17] Another study argued that five factors comprise academic rigor: critical thinking, complex material, challenge, time and labor intensity, and expectation of quality output. Analysis of responses from about 2500 students in more than 200 courses at a university in the US suggest that these factors are highly correlated.[18] Simply, when students talk about a course being "rigorous" they broadly mean "it felt difficult" and commonly say that a rigorous course is intense on multiple levels.

Thus, whether individual students feel a course is hard or easy *can* be for very different reasons. For example, one study found that students who perceived a lack of support and preparation rated a course as being more rigorous.[17] In other words, some students think poorly designed courses are "intensive" and might classify courses with effective learning as less rigorous.

Some research suggests that students' perception of course intensity changes throughout their university journey. While students in both 100 and 300 level courses list workload as the most important factor of intensity, those in a 100 level course were more likely to mention lack of support and motivation whereas the 300 level course students emphasized cognitive demand as a key factor of intensity.[16]

Research on the relationship between perception of rigor and learning (measured as the average course grade) reveals a very weak relationship (< .1 *Pearson correlation* at the course level). However, there was a strong link between course and instructor evaluations and perceived rigor (≥ .7).[19] These findings mostly echo results from more extensive research on the relationship between course evaluations and learning. A study of physics courses found no relationship between learning gains and evaluations of instruction or grading.[20] Meta-analysis of large number of studies (weighted by sample size and study quality) reveals little if any correlation between teaching ratings and learning.[21] Students, on average,

struggle to evaluate how much they actually learn across different modes of teaching and levels of intensity.

Workload

Education scientists argue that under certain conditions, homework can have adverse effects on motivation as well as personal and social development. Nevertheless, most studies find that more time spent on homework is positively correlated with academic achievement. For example, a 2022 meta-analysis of surveys with over 400,000 students from 74 countries in 4-8th grade found a weak relationship between low and medium levels of homework (*d* = .19). The relationship was stronger for 8th grade students and increased over time (surveys were from 1999-2015). There was also some suggestion that students in collectivist cultures benefited more from doing homework than those in individualistic ones.[22]

A recent meta-analysis comparing the effects of workload and cognitive load at workplaces found that workload had a negative relationship with learning and motivation while increasing strain (see more about the effects of cognitive load below).[23]

In higher education settings, Culver et al.[24] found limited evidence to suggest that workload—measured in terms of pages written, books read, and hours spent studying—had much, if any, relationship with motivation and critical thinking at years one and four among undergraduate students. The only exception was that students who read more books had slightly more positive attitude towards literacy (but reverse causality could not be ruled out). Suldo and colleagues, however, found that among AP and IB students, "academic requirements" (including workload and competing priorities) were positively correlated with "school burnout" (cynicism towards school and feelings of exhaustion). Yet, academic requirements were also positively correlated with exam scores but to a lesser extent.[25] A study of business undergraduates in the US found weak and non-significant relationships between time spent studying (*r* = .1) or working (*r* = -.08) on SGPA. However, they found evidence to suggest that students who were better prepared (higher ACT scores) benefited more from spending increased number of hours of homework.[26]

Most studies report negative effects of having a job on academic achievement. However, many studies report mixed results. Scholars argue that part-time jobs (10-25 hours a week) can help relieve financial stress and—with effective time management—increase motivation.

Furthermore, it is worth noting that most employed students report learning benefits from their work experience, including communication, self-confidence, teamwork, and time management.[27]

While many studies report greater workload in BMT courses (and argue this can lead to lower satisfaction and increased stress) some find students spend less time in compressed courses compared to the traditional mode of delivery. These differences were relatively small compared to between instructors or academic subjects.[28] The results suggests that mode of delivery does not necessarily predicate student behavior or *intensity* of teaching at the course level.

Overall, increasing workload can lead to better academic achievement BUT the relationship is weak. Furthermore, there is some evidence to suggest that increased workload can cause stress and burnout. Thus, when faculty increase workload, they need to ensure the time is well spent and doesn't lead to e.g. cognitive overload.

Cognitive Load

Theoretically, teachers and learners want to a) match the level of intrinsic cognitive load (ICL) with students' ability and prior training, b) minimize extraneous cognitive load (ECL), and c) optimize germane cognitive load (GCL). In plain English, learning objectives need to be reasonable given prior training; guidance and materials must be accessible and include minimal distraction; and students should employ tried and tested learning approaches. Relatively little evidence is available that can guide faculty in optimizing cognitive load in their courses.

A randomized control study using multiple measures of cognitive load, found that ECL significantly reduced comprehension and retention compared to ICL (control) and GCL. Comprehension and retention levels were comparable across ICL and GCL (slightly higher for ICL). However, GCL significantly improved transfer compared to ICL and ECL (comparable levels).[29] However, most research in this field is experimental (laboratory) and is not clearly generalizable and does not provide simple practical advice. Nevertheless, the key takeaways are that a) directions need to be clear, b) level of difficulty should match prior training; and appropriate cognitive training (how to organize/think about the topic) provided.

A workplace meta-analysis of "challenge stressors" (see discussion above) found that while workload increased strain and had a negative correlation with motivation and learning, the opposite was found for cognitive demand. This suggests people benefit from cognitive challenges while procedural and scheduling tasks mostly have a negative impact.[23] Using the language of cognitive load theory: we want to maximize/optimize ICL and minimize ECL.

Scholars have only begun mapping higher order thinking among students. Sun and colleagues reveal correlations between metacognition, science self-efficacy, creative thinking, critical thinking, and scientific reasoning (so-called scientific higher-order thinking or S-HOTS). Among these, metacognition had the highest correlation with scientific reasoning and science self-efficacy which in turn highly predicted critical thinking.[30] Relatedly, another study found that metacognition predicts critical thinking skills beyond working memory. In fact, among university students the relationship between critical thinking and metacognition was on average stronger compared to working memory.[31] Finally, a study of high school students found that a growth mindset can reduce perceived cognitive load which in turn increased retention and transfer.[32] These results suggest that confidence, commitment, and self-regulated learning skills can help minimize cognitive load and help build higher-order thinking skills.

Level of Learning

The traditional higher education model is "bottom-up" where introductory courses build the "foundation" before moving on to higher-level skills and more complex fields of knowledge. Cognitive load theory strongly supports this approach, i.e. that students need appropriate preparation for each level of learning. Thus, many faculty pedagogical training programs emphasize starting at the bottom of e.g. the Bloom's taxonomy and slowly moving up. However, both theory and recent empirical evidence suggests that a) sometimes the link between levels of learning is weaker and b) that students might be able to start at higher levels, than commonly assumed. Research in this field is undeveloped.

Culver et al.,[24,33] studying undergraduate students, found that frequency of (self-reported) activities and assignments that required "understanding" to "evaluation" (levels II-IV on Bloom's revised taxonomy) correlated with motivation (e.g. "need for cognition") and critical thinking skills (only in fourth year). All correlations were relatively weak. They found some

evidence to suggest that synchronous rigor benefited first-generation students more than asynchronous (in fact negative for the latter) to develop critical thinking skills. This would support a theory that first-generation students have weaker metacognition skills and thus benefit less from self-directed independent study compared to supervised learning with a teacher/tutor.

Another study also found a weak link between lower- and higher-order learning. The study reported that preparing for a lower-order quiz didn't help much for a higher-order quiz and *vice versa*. However, mixed preparation boosted performance on both types of quizzes.[34] If these findings are robust, it suggests that courses focusing on higher-level learning objectives do not always need factual training. Furthermore, for many courses parallel teaching of facts and higher-level skills could be optimal.

However, some studies find that higher-level training outperforms lower-level tasks for any outcome level. Students were asked to complete either higher- or lower-level writing assignments in preparation for exams with higher- and lower-level questions. Results revealed greater performance on both types of exam questions among those who did the higher-level writing assignment.[35] Another study analyzed data from a course redesign quasi-experiment. A neurophysiology course was transformed from traditional lecture to active learning over a four-year period. Results show that students performed better post transformation on both lower- and higher-level cognitive skill (conserved) questions. More importantly, exams post transformation included more than twice as many higher-level cognitive skill questions, yet performance levels were comparable pre- and post-transformation. Finally, both top and bottom students performed better on exams (conserved questions) in the active learning setting.[36]

Thus, it is not clear (at least in some instances) whether it is necessary to begin at the lower levels. The findings above are preliminary and further research is required to confirm the results and explore scope conditions.

Block Mode Teaching (BMT) and Intensive Mode Delivery (IMD)

Block Mode Teaching (BMT) and Intensive Mode Delivery (IMD) are commonly used terms for "compressed" courses. Students take fewer courses at a time over a shorter period

compared to the traditional mode of delivery (TMD). Scholars study and debate the perception, benefits, and drawbacks of BMT.[37] This section discusses each factor in turn.

Perception. Student preferences for BMT are mixed with some studies finding majority support for traditional mode and others in favor of compressed teaching.[15]

Those who prefer the traditional delivery mode over BMT often claim there isn't enough time to absorb, digest, or reflect on the course materials. Relatedly, some studies find that students believe they learn less in BMT.[38] Additionally, some report more fatigue and stress following intensive learning.[38,39]

On the other hand, studies find that many students are more positive towards intensive learning.[40] Students who failed a traditional course (in psychology or anatomy) and then repeated the course in a compressed format thought the "workload was better [compared to] the traditional university model" (85% agreed/strongly agreed).[41]

Sometimes students' experience and perception is mixed.[42] Loton and colleagues studied a natural experiment where BMT was introduced at a university level in Australia. They found that teacher satisfaction increased when moving to a BMT while course satisfaction decreased (in particular perceived workload).[43] A study of management students in India found using between- and within-individual data that students in compressed format courses felt more engaged, focused, and concentrated compared to the traditional format. At the same time, respondents said they learned more, were better organized, and less stressed in traditional format courses.[38]

Interviews with faculty and students reveal concerns about overload (too much content and/or many learning objectives), surface learning (no time to digest and gain sufficient familiarity), faculty workload, and assignment feasibility. For example, faculty have raised concerns that the shorter time available outside of class limits what kinds of homework can be assigned (especially group work)[42] and in-class activities implemented (e.g. inquiry-based approaches).[44]

Trinh and colleagues collected data from five institutes with BMT and identified 14 positive and 7 negative factors associated with BMT. Among the positives were e.g. opportunity for

course redesign, curricular flexibility, and more timely performance feedback; and negatives included e.g. increased self- and group-study, workload, and grade inflation.[45]

Benefits. Several studies report that BMT provides better support for disadvantaged students, e.g. first-in-family and low SES. A study in Australia found that both traditional and "new generation" learners improved their performance with BMT, but the disadvantaged more so.[46] Another study observed students who failed a class and consequently had to repeat it and found a greater increase in performance when the consequent course was compressed compared to the traditional mode. Students repeating the same traditional course improved by about 20 percentage points while those taking a BMT improved on average by 30 percentage points.[41] Qualitative interviews reveal that disadvantaged students note that the fast pace forces them to improve their metacognition and study habits.[39]

A study in the Netherlands explored the effect of varying number of parallel courses (how many students attend at the same time, lower being closer to BMT) on passing first-year examinations across multiple disciplines. Findings suggest that for each fewer parallel course, the probability of passing increased by 7 percentage points.[47] Goode and colleagues analyzed matched pairs of students who took both TMD and BMT courses and found significantly higher pass rates, commonly about 15 percentage points, in the latter.[48] These studies suggest that focusing on fewer courses, as in BMT, can improve pass rates.

Relatedly, studies report comparable[49] or higher average grades in compressed format courses.[50] A study of transition from traditional mode to BMT ($N > 85{,}000$) found "substantial increases in performance" in particular among disadvantaged students.[43] A study where the same faculty repeated courses in both BMT and TMD across multiple semesters found consistent evidence that students in the compressed format performed better (about 10 percentage points) and rated the course more highly.[40] Comparing grades of students who took both BMT and TMD courses revealed significantly higher marks in the compressed format.[51] One study suggests that higher GPAs in BMT vs traditional mode do not seem to be due to grade inflation as students performed at a comparable level in future courses.[52] Another found comparable knowledge retention up to 12 months past delivery across BMT and TMD.[53]

Drawbacks. Many students report increased stress.[38] A quasi-experimental field study in Germany, suggests that reducing the years to graduation from high school by a year (not BMT) increased stress (*d* = .3; more among females *d* =. 4) and mental health issues (*d* = .17; only among females) but also improved general well-being (*d* = .2; only among males). Limited if any effects were found on self-efficacy.[54]

Missing a class session in BMT becomes more problematic, the shorter the course format and the longer the sessions. Missing a single session in a traditional 14-week format is commonly 1/36th of contact time, while in compressed format it can be up to a third. Then again, students might be able to retake courses more quickly in BMT compared to TMD.

Challenging Programs and Course Loads

Students in International Baccalaureate (IB) and Advanced Placement (AP) programs, that are considered more intensive, on average have higher academic performance and are more likely to select longer college programs.[55] They also report being more stressed without clear evidence of negative impacts. Research also suggests upper level students in such programs have higher levels of positive stress (eustress).[56]

More detailed analysis of psychosocial functioning and academic performance among IB and AP students—who on average report more stress and perform at a higher academic level—reveals that achievement motivation (close to "self-efficacy") and cognitive engagement (close to "self-regulation") predicted both better mental health and academic performance. Affective engagement (satisfaction with teachers, school, and major), approach/problem focused (metacognition + social regulation + relaxation) and authoritative parenting (parents available and involved) are negatively associated with mental health problems. Eustress (positive stress) was positively correlated with academic outcomes. Risks factors were unsurprising except academic requirement stress had a relatively strong positive relationship with "school burnout." Classmate support and "diversion" (as a coping strategy) had a negative relationship with mental health problems AND academic performance. "Rumination" (as a coping strategy) had a negative correlation with mental health problems but positive with academic performance (very surprising). Most relationships are relatively small (average *d* <= .3).[56]

Studies on the effects of course load on academic performance reveal mixed results. A longitudinal study (fixed-effects) found that the relationship was effectively zero (*d* = .01). Additionally, they found that disadvantaged students were more likely to benefit from a higher course load compared to top students, albeit again, the relationship was weak.[57] However, evidence from an unpublished natural experiment (West Point) showed that a higher course load led to lower GPA (e.g. A to A-) and higher course failure rates (by about 12%).[58] However, Aina and colleagues analyzing a natural experiment (unpublished manuscript) where the number of courses were reduced while workload was mostly kept constant found the reverse, i.e. taking fewer courses resulted in significantly greater failure rates. Especially among first year students from less affluent families. Yet, those who managed to graduate within this system of greater workload per credit were more likely to get jobs and sooner.[59]

DISCUSSION

Separating causes

More research is needed to separate the effects of causes. Currently, it is difficult to disentangle the effects of e.g. scheduling format, pedagogical development, cognitive challenge, focus, and increased/decreased standards. When universities decide to implement a new mode of delivery it is commonly accompanied by pedagogical training, faculty incentives, new hiring criteria, etc. It is also possible that universities were on a path of improvement *before* deciding on a more intensive mode of delivery. Selection and confounding are likely to bias results. While many studies report positive outcomes, very few convincingly deal with confounding. Thus, the commonly mixed results suggest that *how* intensive teaching and learning is implemented matters and perhaps even more than the exact length or mode of delivery.

Mechanisms

Given the limited number of quality studies in this field, there is precious little research into the mechanisms driving benefits or drawbacks of intensive teaching. Future research should aim to identify causal mechanisms. For example, studies report that disadvantaged students perform better in intensive courses. However, there is very little if any research on the mechanism in play. Is it that the compressed format reduces the time benefit advantaged students have (due to fewer non-academic obligations)? That disadvantaged students struggle more with focus and commitment in the traditional mode. Alternatively, compressed format courses attract different kinds of students.

CONCLUSION

Overall, the evidence suggests that focused and cognitively challenging training of high-level skills is an optimal approach in higher education. On average, intensity seems to produce better learning outcomes, increase equity, while avoiding serious negative consequences. However, course and curricular design seem to play a key role in promoting benefits and minimizing harms. A poorly designed course that requires a lot of work or effort to figure out expectations might lead to cognitive overload, limit learning, and lead to mental health issues. Similarly, a poorly scaffolded curriculum can lead to unmanageable stress and ultimately burnout.

Arguably, the key feature that distinguishes intensive learning from current delivery modes is focus, i.e. fewer courses at a time. Academic standards, student effort, and the quality of course design can be raised in any mode of delivery. Moving from a 14-week to a 7-week format can have these benefits, and with good planning, they are even likely, but not guaranteed. One concern is that when faculty redesign courses for IMD they try to incorporate too much materials. Even if the expected time is the same between a 14- and 7-week format, teaching the same materials in the same way might cause work or cognitive overload. Relatedly, redesigning the curriculum needs to adequately scaffold courses, ensuring students have sufficient preparation for intensive courses. In TMD students might be able to cope with one intensive course because the other three are manageable, while in IMD all courses are challenging. Thus, IMD requires more careful thinking about scaffolding training across courses to ensure a reasonable cognitive load.

Consequently, it seems clear that course length is not a deciding factor for learning. What happens during the course, both inside and outside the classroom, and in relation to previous and concurrent courses is what matters. Thus, courses of any length can cause cognitive overload either by themselves or combined with others; or be too easy.

Given the decline in the time students spend learning and lower expectations, there seems to be an opportunity to increase intensity. While the research on intensity is incomplete, there is sufficient evidence to suggest that increasing intensity can *improve* learning outcomes and equity. However, such an effort should be accompanied by course redesign, faculty training, and an iterative curriculum revision. Furthermore, universities should

develop measurements to monitor cognitive load, mental health, confidence, and motivation – all of which can reduce or eliminate the benefits of a focused and challenging learning environment. Coupled with reliable and valid measures of authentic (transferable) skills can provide a comprehensive overview of the benefits and challenges of raising standards in higher education.

Proposals

Raising standards and requiring more effort is possible and can even lead to higher achievement and lower fail rates. However, moving to a more intensive teaching and learning mode should be accompanied by the following.

1. Course redesign which limits external cognitive load, incorporates metacognitive training, and relies on tried and tested pedagogical activities to train skills. This might require faculty training.
2. Iterative curricular revision to ensure scaffolding across courses: a) strong links between sequenced courses and b) reasonable workload assuming students spend the expected hours for each course.
3. Monitoring (at course and major level):
    a. mental health
    b. confidence and motivation
    c. failure rates
    d. cognitive load
    e. authentic assessment
    f. transfer (future achievement)
4. Provide academic and mental health support. Raising standards and effort can lead to challenges which students need help to navigate.

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ENDNOTES

[a] More narrowly, and/or under some conditions, cognitive load can refer directly to "working memory," i.e. how much information humans can hold and manipulate in their brains at the same time.
[b] Some argue the latter two (ICL and GCL) are theoretically equivalent, see e.g. ????