Classroom Talking Points

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A paper prepared for the 2021 ASEE Annual Meeting

Submitted: May, 2021

Background

This Complete Evidence-Based Practice paper introduces a structured handout tool, referred to as "talking points," in use in a first-year engineering classroom. Extensive background is provided in the form of a selected literature review, citing influential books on pedagogy and how they shaped the types of questions used for the handout and the way it is integrated into the curriculum. Engagement with, and completion of, the talking points handout is optional but encouraged. Data to support the arguments presented herein includes the quantification of completion rates for one semester's worth of talking points documents for three sections, totaling approximately 80 students with complete data. Primary analysis uses overall course grades as a metric of learning outcomes, examining correlation between course-level success and optional completion of these ungraded document. Secondary analysis includes the relationship between completed handouts and exam performance on a specific topic.

The development of this classroom engagement tool occurred over years as a result of various readings on pedagogy and classroom management, which are explored in the literature review. Additional literature on ancillary topics such as student responses to optional work is explored as well, but only a sampling of the wider body of work is reviewed.

Literature Review

There are a handful of book resources that played a significant role in the development of the talking points document as a pedagogical tool. These influencers are explicitly pulled out as longer-form literature review, provided in the order in which the author first encountered the material. The various readings build on each other, each modifying the pedagogical world-view slightly to support the use of a tool such as Talking Points to meet the needs of students in the class. At the end of the literature review, a brief section is provided on related articles in the area of optional work, both from the student and instructor perspectives.

Learner-Centered Teaching: Five Key Changes to Practice [1]

Weimer's book on learner-centered teaching proposes five key changes for practice, including: (1) the balance of power, (2) the function of content, (3) the role of the teacher, (4) the responsibility for learning, and (5) the purpose and process of evaluation. As a source of best

practices in pedagogy, this book was the first of its kind encountered by the author, and subsequently has had the greatest impact on practice.

The discussion on the balance of power introduces the idea that students should have agency in what they are learning and how they are learning it. Not that the instructor should abdicate authority entirely, but that it is possible to meet the learning needs of more students within the classroom if multiple paths are made available to help master the content of the course. On the simplest level, this may take the form of asking students what content was unclear at the end of a lecture, and sharing responsibility for the learning of the material by spending a few minutes clarifying those concepts before the period ends.

An examination of the function of content suggests that it is ethical to teach less content in favor of spending a small portion of student energy on self-reflection, helping them to develop as learners. When tangential conversations occur about the applications and implications of content in a lecture, instructors recognize these conversations for the valuable learning moments that they are, while many students believe that class time is being wasted with off-topic discussion. By formally incorporating these "off topic" discussions into prompts during a lecture, it may be possible to help students hold a more nuanced view of the learning that occurs during a class period.

On the topic of the role of the teacher, Weimer uses an extended quote that helps to refine notions of the relationship between instructor and student: "Good teachers find ways to activate students, for they know that learning requires active engagement between the subject and 'object matter.' Learning requires discovery and invention." Or, put more succinctly: "A student cannot be forced to learn, and a teacher cannot learn anything for a student." The application of this idea takes form as optional work, where curriculum is designed by the instructor to help students gain a full understanding, but it is the decision of each student how much they will choose to engage with the content.

Weimer's take on responsibility for learning is that faculty have an unhealthy large share of the load. As educators, faculty design "rules, regulations, and stipulations" to force student behaviors into line with our assumptions about what positively affects learning. The argument is made that this is a disservice to students, contributing to graduates with little commitment to or respect for learning, who cannot function without structure and imposed control. However, the author believes that Weimer in this instance has lost sight of the pressures on junior faculty; when a student is allowed to fail a project because the scaffolding of intermediate deadlines is not done for them, they hold the faculty responsible and not themselves. The negative repercussions on faculty evaluations if students are allowed to fail is disproportionately large for junior faculty members, and the very tasks that Weimer resists become essential tools to support student perceptions of success. Attendance is required (or graded) because the assumption is that it positively affects learning and motivation; larger assignments are submitted in installments because students procrastinate and do not reserve enough time at the end of the project to adequately complete it. Faculty rely on the extrinsic motivators of points, required homework, and quizzes that turn classrooms into token economies precisely because it leads to fewer

students falling through the cracks. It is the belief of the author that few students begin college (or end it) with the ability to identify critical information during the course of an hour classroom meeting, and scaffolding these key points for students is a responsible approach to education that will help and not hinder student success. Rather, instead of building student motivation and self-advocacy in the context of classroom lecture, this might be accomplished with open-ended project-based work.

Finally, on the purpose and process of evaluation, Weimer falls firmly into the camp that all evaluation should be formative evaluation – an opportunity to create another learning moment for the student. Although grades still serve the gatekeeping role with fair, equitable, and rigorous standards, flexibility can be introduced to allow students an opportunity to fix errors and resubmit, learning from their mistakes and ostensibly correcting misconceptions. This has been shown to lead to better outcomes on the final summative assessment (exam), but at a cost both of time to the student formally preparing a resubmission, and to the faculty to potentially face double the grading load on any major assessment.

Ultimately, Weimer's learner-centered approach provides an optimistic view of the relationship between student and instructor and the shared responsibility that can exist toward learning. As a theory book for new or prospective faculty, it serves its purpose well to redirect the focus of curriculum development away from covering content and toward student outcomes. However, the explanation of how to apply these beliefs in a classroom setting is handled with anecdotes of sample classroom activities, and more support is needed on the topic of assessment tools.

Classroom Assessment Techniques: A Handbook for College Teachers [2]

Angelo and Cross's book of 50 classroom assessment techniques has been required reading in academic circles for nearly thirty years. The fifty techniques included are well documented both with theory and directly applicable samples, and are divided into three categories of: (1) assessing course related knowledge and skills; (2) assessing learner attitudes, values, and self-awareness; and (3) assessing learner reactions to instruction. The first category, course related knowledge and skills, provides techniques to conduct what is classically thought of as assessment with homework, exams, grades, and all the rest. However, the book provides critical tools for junior faculty developing as educators, helping to understand student attitudes and expectations in the second portion, and how those attitudes translate into perceptions of the instructor in the third portion. Many of the assessment techniques have made their way into common practice, and are staples of the kind of formative assessment processes that Weimer advocates for.

Some of the more widely used classroom assessment techniques (CATs) include muddiest point, think-pair-share, concept mapping, jigsaw, and student-generated exam questions. Muddiest point gets a quick survey back from the class about the least-clear thing from a lecture or activity. Think-pair-share allows students to develop answers to a more complicated question, test out those answers with a neighbor and build consensus, and then

confidently share their answer with the class at large. Concept mapping provides a methodology for drawing out content as a set of linked ideas, effectively visualizing the constructivist perception of knowledge gain. Jigsaw places more responsibility on the students, breaking the class into groups and assigning one person from each group to become a subject-area expert on a subtopic (such as reading a specific journal article), and subsequently having each group member teach their peers in the group the piece of the overall puzzle that they mastered. Finally, student-generated exam questions allow students to work through the key concepts learned during a unit that deserve attention on an exam, anticipating many of the topics they will face while creating one question that may be on the exam itself. These CATs provide an extensive list of places to start when developing learning moments in a curriculum, but do not provide insight into how different students might respond in different ways to a given activity.

Ways of Learning: Learning Theories and Learning Styles in the Classroom [3]
The field of learning theory is a complex mix of pedagogy, psychology, and neuroscience. However, Pritchard's Ways of Learning provides an excellent summary in book-form, succinctly but thoroughly explaining the differences between learning frameworks such as behaviorist and constructivist, as well as various models in the literature on multiple intelligences and learning styles.

Behaviorist views on learning and knowledge are based on an assumption of a causal relationship between a stimulus and a response. The behaviorist belief that learning occurs through repetition led to the focus on rote memorization that was previously the standard form of education in the United States, and can still be found around the world as common practice today. The constructivist understanding of knowledge formation is more popular in modern educational practice domestically, which believes that learning takes place as new information is built into and added onto an individual's current structure of knowledge, understanding, or skills. Each new piece of information taken in is informed by and connected to the things known before. This is particularly appealing in academia, as the hope is that students are able draw upon their prior knowledge to help them learn in class, and that they will in turn find the things taught to them to be useful in the future.

The idea behind multiple intelligences is that current metrics of performance such as an IQ test or the Standardized Aptitude Test (SAT) measure a small percentage of a student's skills and abilities, and that many more kinds of intelligence can and do contribute to learning in the classroom. A classroom application that embraces the idea of multiple intelligences may include verbal and visual explanations of content, perhaps with some multimedia built in, while student interactions might include personal reflections and group collaboration, with verbal, written, and sketched responses. Although some students prefer the classical academic lecture format to learn material and find a multi-faceted approach to be distracting, this method of communication is useful to reach a broader spectrum of students in the class, raising the total number of students actively engaging with the content.

The literature on learning styles is something of an outgrowth from the idea of multiple intelligences, exploring not just the media by which students learn best, but the way in which the material is organized as well. Research on learning styles tends to take the form of a framework for understanding student differences, with subsequent research exploring implications for learning outcomes within those frameworks. One popular framework that has seen high levels of application is the Felder-Silverman model from the late 1980s, which profiles students along six binary styles or preferences, including: sensing versus intuitive, visual versus verbal, inductive versus deductive, active versus reflective, and sequential versus global. Some of these are quite powerful ways of conceptualizing how students learn; there's logical truth to the fact that some students prefer to learn topics in small pieces in a sequential way, while other students prefer to see the global framework of how everything fits together. However, in a follow-up paper more than 20 years after the learning styles original paper was published, Felder responds to the growing body of literature that is both complimentary and critical of the framework originally proposed. Felder argues that "The optimal teaching style strikes a balance (not necessarily an equal one) between the poles of each dimension of the chosen learning styles model. When this balance is achieved, all students are taught sometimes in their preferred mode…" [4] This is, perhaps, an essential take-away from all of the literature on best-teaching practices, that no single activity or method is a silver bullet to teach every student, and that a measured combination of best practices that align with both the instructor and the content is the goal being sought.

Small Teaching: Everyday Lessons from the Science of Learning [5]

Lang's *Small Teaching* represents a prime example of the current generation of teaching-advice books. It fuses pedagogy, psychology, and neuroscience literature, applies it directly to the classroom setting, and wraps it all up with engaging anecdotal stories that illustrate key points of the book. The goal of the book is to provide practical small changes that any faculty can implement that will improve student learning outcomes in the classroom without significant increases in prep time or grading. Organizationally, Lang divides the book into three sections, each containing three sub-sections. The key areas of the book related to the current investigation include retrieving and predicting within the category of knowledge, and connecting within understanding.

Lang explains in the knowledge section that the reasoning and critical thinking skills that are top priorities in modern education require extensive factual knowledge to empower them. The section on retrieving initially appears to put Lang in the behaviorist camp of learning theory. He argues that any type of memory tasks that will appear on exams should first appear in class and again on homework. If a student encounters a new format of question for the first time on an exam, the performance of the student is then a measure of their ability to decode the question format, and not just their mastery of the content in the course. However, in the next section on predicting, Lang clearly embraces the ideas of the cognitivists. In a passage explaining the benefits of asking students to make predictions about a topic before they learn the new content, Lang says: "When new facts are woven into a dense network of connections, they are implanted

there more firmly and are more likely to be activated in multiple contexts. And because they are tied to lots of other facts and information, the expert can more easily see how to use and apply a fact in other contexts than a novice." The tone of the book is of sincere practicality, with cautionary messages as well such as: "Remember that part of the reason predictions work is that they require students to draw up whatever knowledge they might have that will assist them in making their prediction. If you ask them questions that are so specific that they have no prior knowledge to activate, you won't see this benefit."

The section on understanding reinforces the main cognitivist notions that information exists within context. Pulling in neuroscience resources, Lang writes: "The knowledge in our minds consists of neuronal networks in our brains, so if that knowledge is to grow, the neuronal networks must physically change… As an expert in your discipline, your network is thick with connections. As a teacher in your discipline, your task is to help your students develop a denser, more richly connected network of knowledge and skills in your course content area." Harkening back to Weimer's approach to sharing the responsibility for learning, Lang further recommends: "You can't fire the synapses in your student's brains. For the connections to be meaningful and effective, the students have to form them. Your task is to create an environment that facilitates the formation of those connections rather than simply lecturing at them about connections… Consider providing students only with the scaffolding or framework of lecture material in advance of class; let them fill in the framework with their own connections."

Why Students Resist Learning [6]

Written by Tolman and co-written with a dozen undergraduate students, *Why Students Resist Learning* outlines a theoretical framework for the causes of student resistance, both active and passive, and includes a wealth of relatable anecdotal stories that illustrate the complex dynamic that exists between students and educators. Because of the mix of authorship between faculty and students, the book provides a somewhat balanced view of shared responsibility for lack of student engagement. Examples of student non-compliance are viewed through multiple lenses of why each actor makes the choices they do, and provides practical suggestions for how to improve (though not necessarily fix) many situations.

The framework provided splits resistance into two root causes, asserting autonomy and preserving self, each with examples of active and passive resistance. The most pertinent examples relative to the current investigation involve self-preservation, with active behaviors like focusing on a surface approach to learning, and passive behaviors like minimally participating in class, being withdrawn and not speaking or giving feedback. Tolman sees lack of participation as an expression of retaining self-confidence and good standing among peers, implying that the potential of answering questions incorrectly is enough of an emotional deterrent to generate a one-sided classroom of lecture without discussion. Strategies suggested by the book involve the development of teacher responses that value student answers in a non-judgmental way and creates an atmosphere where not knowing is acceptable.

An alternative viewpoint of what is happening comes from Newstetter, who found that even in classrooms where best practices for learner-centered teaching are practiced, students often ignore the intended sequence and format of experiences, instead prioritizing efficiency with divide-and-conquer techniques that secure grades without providing a thorough learning experience for all [7].

Selected Literature on Optional Work

The book resources described (in some detail) above provide something of a story arc: (1) active student engagement with shared responsibility for learning is necessary; (2) there are many tools and resources to build into curriculum to provide opportunities for this engagement; and (3) there are reasons why students refuse to engage with courses despite the application of best practices to create opportunities for them to learn. What remains to be explored is the result of optional work; what happens when Weimer's view of shared responsibility is put into practice and students are given the option to elect not to do elements of the curriculum?

The most-basic finding of optional work, particularly of optional note-taking, is unsurprising. In an early study on computerized self-directed learning, three groups of students, no notes, optional notes, and required notes, were given a post-test after they completed the learning module; the findings are as expected, with the optional note takers spending longer on the lesson and doing better on the test than the non-note takers, with the required note-takers taking the longest and doing the best on the post-test [8]. There is a clear relationship here between the additional benefit of taking notes compared with the additional costs of doing the extra work that makes logical sense. However, there are times when only some students would benefit from completing additional work, and optional work opportunities might meet those needs without increasing the time commitments of all students.

Extra credit work seems like the best-case scenario for optional work, embracing shared responsibility and allowing students who are struggling with the course to complete additional assignments to further their understanding and improve their grade. However, the research on extra-credit work indicates that the group of students selecting to complete the work is often the students already performing well in the course, and not the ones who need the boost [9].

At-risk student populations are often the target of supplemental work. In many university systems, placement exams in mathematics help to determine the need for students to complete supplementary coursework to help with college readiness. The state of Florida recently (2013) created an opportunity to examine a case study related to this supplemental college-preparedness work, when the State passes legislation prohibiting higher-education institutions from requiring placement tests and remedial coursework, transitioning these required courses to optional courses instead [10], [11]. Park et al. followed the effects of this legislation on underprepared first-time-in-college students who would have previously been enrolled in the remedial coursework, and found that students enrolling directly in intermediate algebra (the typical first college-level math course at the institutions investigated) had a 40% pass rate for the course, while students who took the now-optional developmental math course beforehand increased their pass rates to 53%.

Among the population of underprepared students that they surveyed, approximately 1/3 selected to take the optional developmental math course, 1/3 enrolled directly in intermediate algebra, and 1/3 elected to take no math courses at all.

Literature Wrap-up

Ultimately, the literature leaves us with a tangle of intentions, and a list of unintended consequences that we wish to avoid. Shared responsibility between student and faculty can result in a collaborative classroom and graduates that have a greater appreciation for learning, but optional work needs to be used carefully, as the students most likely to engage with it are often the ones who stand to gain the least. There are a great many assessment tools that have been developed for use in the classroom that can help to move toward a climate of shared responsibility, but student neurodiversity suggests that no one assessment should take priority, that the use of a suite of tools will reach and engage with the greatest number of students. Finally, students have agency and will choose (or not) to engage with our assignments to varying degrees, and the question remains open for debate as to whether it's the instructor's job to attempt to force all students to complete the work, or to allow students to make the choice to succeed or not to whatever degree they wish.

What are Talking Points?

Talking points are a tool developed to aid with scaffolding in medium-sized classrooms (15-60 students), currently being applied in a first-year engineering program. It incorporates multiple active learning elements into a single daily classroom handout. The document is collected and checked for attendance, but returned ungraded and unmarked to students at a later date. The nucleus of the idea for the handout comes from Lang's discussion on making connections, where he says: "Consider providing students only with the scaffolding or framework of lecture material []; let them fill in the framework with their own connections." [5] Samples of completed Talking Points handouts are shown below in **Figure 1**.

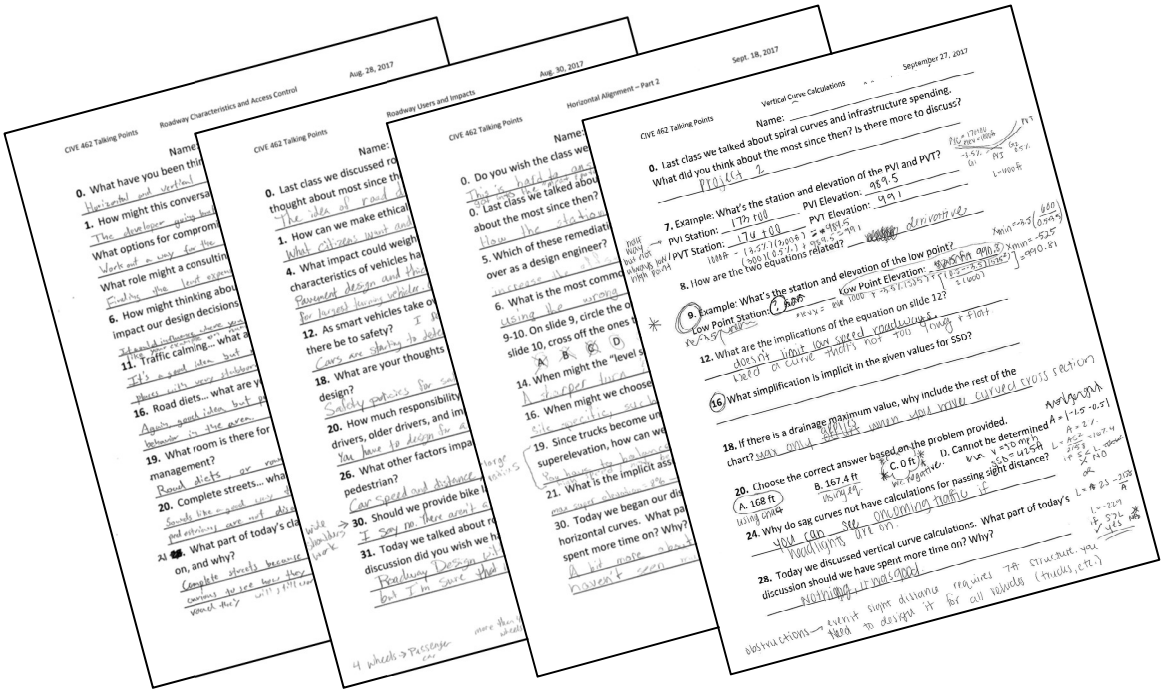

Figure 1 Sample talking points documents

The document is created or edited in the time between the lecture notes are completed and class is held. In reviewing the lecture notes, times throughout the class period are identified as potential learning moments, either by way of sample problems to solve or interactive classroom discussion to have. The act of creating the document is itself a critical aspect of preparation for the class period, ensuring that there are routine interruptions in the instructor monologue to refocus students on important content.

Referring to the literature reviewed earlier in the paper, the handout serves as a response to the importance of active student engagement in the class. *Learner-Centered Teaching* views active interaction with all students participating as a key component of the shared responsibility for learning, and a requirement to result in graduates who value learning and are self-motivated *[1]*. *Why Students Resist Learning* believes that lack of classroom interaction is a form of passive resistance to maintain self-esteem, that students fear giving wrong answers and the reprisals that will result either from the teacher directly, or in the form of being devalued in their peers' eyes [6]. *Classroom Assessment Techniques* provides tools to track and improve engagement in the classroom, as well as get feedback on student perceptions of lecture and discussion quality *[2]*. However, it is the larger concept of neurodiversity as expressed in the *Ways of Learning* that most-influences formatting and purpose of the Talking Points handout *[3]*. Every student has a different level of comfort with public speaking, a different perception of the role of student and teacher in the classroom, and a different level of aptitude to absorb information and process it in real time before providing an answer to a question just posed. One key question in creating the handout as formatted is whether it is possible to create a tool that allows all students to be active participants in the class, without the traditional appearance of engagement. By following along

with the discussion and recording their answers in private, are the same benefits seen as those gained from active interaction such as participating in classroom discussion?

The various elements incorporated into the tool are displayed below, in **Figure 2**. On the left we have beginning (red) and ending (green) the class, with the progression of questions through the lecture (blue), and on the right side we have a mix of simple sample problems (yellow) and discussion questions (purple).

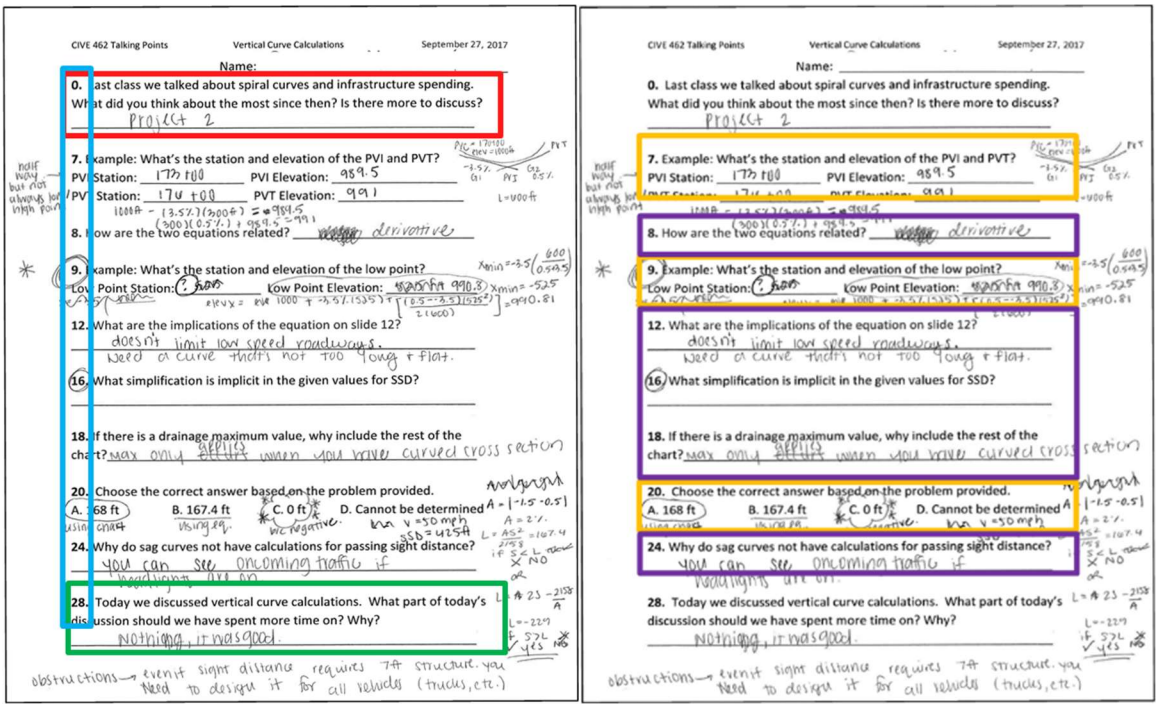

Figure 2 Key elements of the talking points document.

On beginning the class, the first question on the handout, shown in red in **Figure 2**, ties to either reflecting or predicting, both as described by Lang [5]. The question is sometimes a reflection on what happened in the previous class to jog student memories about where we are on the learning path of the semester, but more often it's tied to predicting, with the first slide of each day exhibiting the "thought of the day." A standard reflection question used is "what have you been thinking about most since the last class?" A student once asked why that question was on the handout, and the reply was something to the effect of "I need to know if there's a topic that we need to spend more time on, but mostly it's there to imply that you should be thinking about the class when you're not here." One example of a predicting-type question at the start of a lecture on programming methodologies in C++ would be to ask students how we might think of completing homework as a while-loop or a for-loop. Students then begin to develop the necessary cognitive framework right before the class where these concepts are taught with application in C++. If students are able to set aside the fact that they have not been explicitly taught these concepts yet, they are then able to draw on the related information they know, tying the new knowledge into their existing web of knowledge in line with the cognitivist view of

learning. The science says they will be better able to remember the theory and syntax of these loops if they are able to tie that new knowledge back to existing information they have, such as the process of completing homework assignments [5].

The last lecture slide always lists what's next, with the schedule of the next two or three classes and assignments due, while the last question on the handout, shown in green in **Figure 2**, asks some form of "what lingering questions do you have about today's class?" This type of question is well-documented in the literature and commonly referred to as the muddiest-point [2]. This question helps students to clarify for themselves which content they most-need to review before the next class or homework, while also giving insight to the instructor about which areas of the class content need to be improved for the next iteration of the course. On rare occasions there is a consensus among the class about a topic that is unclear, and the content is revisited at the beginning of the next class. Anecdotally, following up with individual students before class about their response to the final question on the previous day's handout is a critical practice for continued engagement. If the work is optional, and students don't believe it is being read, completion rates quickly fall off as the semester progresses.

The numbers on the handout, highlighted in blue from **Figure 2**, are tied to the number of the slide in the PowerPoint presentations. Before the class is held, this serves to aid the instructor with ensuring that regular interruptions are provided in the lecture content where student input is required. During the class, the slide numbers are always shown during the presentation and students are able to anticipate upcoming points of discussion and can write down an answer to gain confidence before share with the class. Finally, after class students can use the question numbers to help frame questions about content that remains unclear, allowing the instructor to quickly move to the pertinent slide.

Depending on the type of content being presented during a given class, the balance between discussion questions and sample problems shifts. The example provided in **Figure 2** comes from a day when sample problems (in yellow) and discussion questions (in purple) were somewhat balanced. Sample problems give students a space to organize their work and record answers to in-class questions that serve as preparation to complete homework assignments. Discussion questions are designed to be extensions of the information on the slides, but are purposefully not answerable just based on the information on the slide. By identifying points of discussion that are not fully articulated in the lecture notes, pressure is placed upon students to attend class and participate in the active learning interactions offered by the talking points handout.

The final follow-up for the talking points content are exams in any given content area. Approximately 30% of the points of each exam are made up of 2- or 4-point questions about in-class discussions that can be easily answered if the student was present and paying attention, but would not be immediately clear if they were absent. One example comes from a lecture on an introduction to [engineering] design, where students watched a Mark Rober video about a rock skipping robot and discussion included the various models, proof of concepts, and prototypes that were developed. When the exam subsequently asks students to identify what models Mark

used in his video and briefly explain what concepts he was communicating with them, they needed to remember that he used a basketball to explain why throwing a rock from higher up is important, or a gyroscope to explain why spinning the rock is important, both of which are included on the talking points handout from the day and are pictured in the slides that accompanied the in-class discussion following the video. Students are directed at the beginning of the semester that the talking points sheets are the first place the instructor reviews for new exam questions, because time spent talking about a topic in class indicates its importance, and that they are free to ask any and all questions they like about their notes during office hours before the exam. It follows that although the documents are optional to complete, it is in student's interest to fill them in to help cement key takeaways from classroom discussion. However, the question then becomes whether student learning outcomes are dependent on this engagement, or whether performance in the class and completion of these documents are simply both correlated to higher-performing students.

Method

Analysis focuses on examining the learning outcomes of students who choose to complete the ungraded documents versus those who do not. Engagement with the talking points handout is optional, but encouraged. Data to support the arguments presented in this paper includes the quantification of completion rates for one semester's worth of talking points documents for three sections, totaling around 80 students. This aggregate completion scores are analyzed against overall course grades, and exam scores in the area of programming.

Results

For each talking points document, the number of completed questions was entered into a spreadsheet, with students by row and date by column. The data is then normalized by dividing the number of questions responded to by the total number of questions, to arrive at a weighted average for the percentage completion on all handouts over the course of a semester. Ultimately it was found that response rates included the full range from 0% through 100% completion, with the average rate of 65% of questions getting a response. By comparison, overall course grades ranged from 77.1 through 99.3 with an average grade of 93.0. The data points mapping percentage completion of talking points handouts against overall course grade is shown below in **Figure 3**.

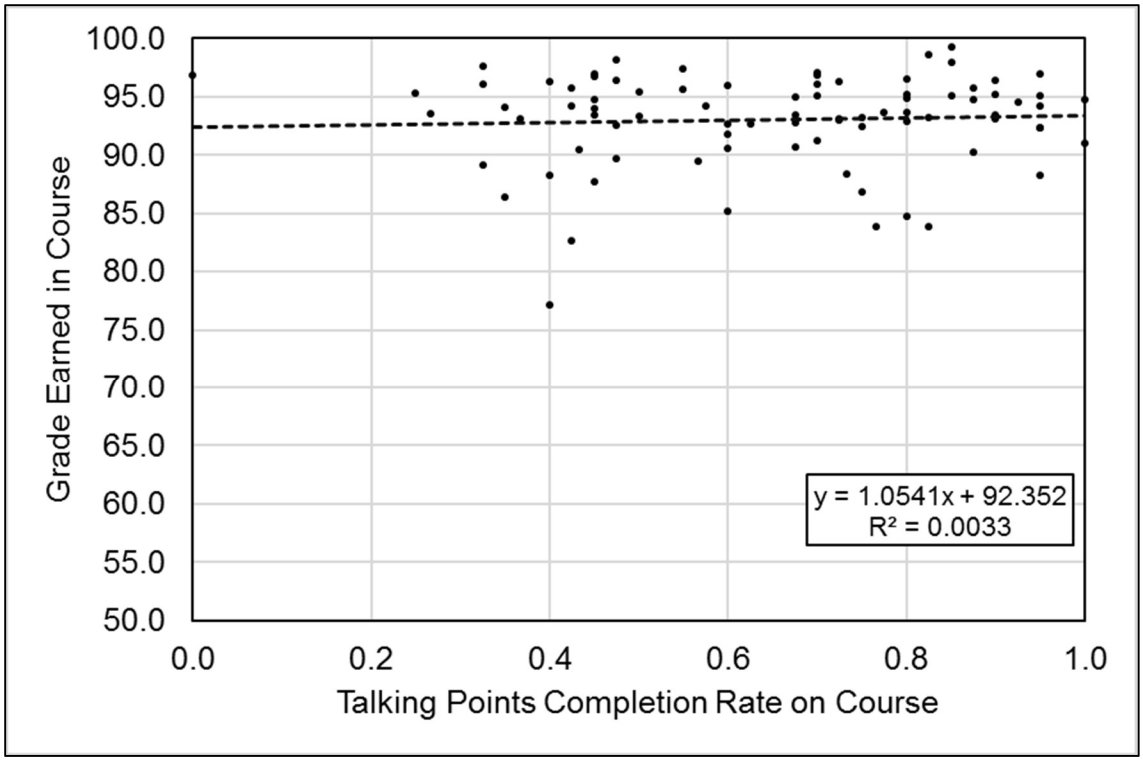

Figure 3 Talking Points completion rates versus overall score in course

The coefficient of determination (R^2 value) of 0.0033 as shown above in **Figure 3** indicates that a very small percentage of the variability in student grades can be explained by the optional completion of the talking points handout. Further, examining the equation of the best-fit line for linear correlation, we see that the expected grade for a student completing none of the handout questions is a 92.35, while the expected grade for a student completing every question in every class only raises to a 93.40. From an efficiency perspective, the additional time and energy spent completing these handouts is not an effective use of student time to improve their overall grade in the course. However, it's worth noting that this course is heavily project-focused and only around one quarter of the grade comes from exam grades, with only about 30% of those questions directly tied to the in-class discussion questions. Completion of the handouts, while not tied directly to overall grade achievement in the class, might be tied directly to exam scores, as explored below in **Figure 4**.

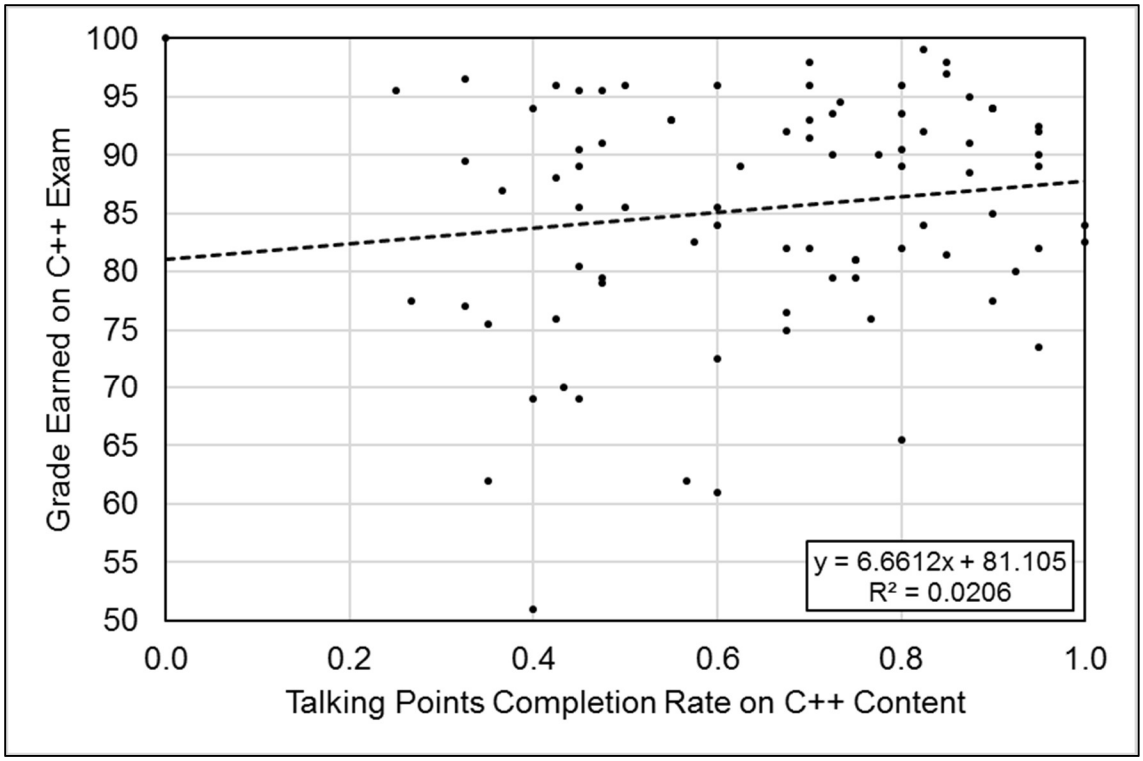

Figure 4 Talking Points completion rates versus exam scores on C++ content

As with the overall grade data, there appears to be little indication in **Figure 4** that completion of the handouts is a significant factor in student success on exams in the course, with the coefficient of determination indicating that only 2.06% of the variability in student scores can be attributed to the completion rates of the talking points handout. This, despite the fact that up to 30% of the exam points are based directly on questions appearing on the handout, which are used as the nucleus for classroom discussions. There is an indication that completing the form and earning a good grade on the exam are connected, with the expected grade for students leaving the handouts blank being an 81.10 and the expected grade for students completing every question being a 87.77, but the wide distribution of the scores relative to response rate on the handouts indicates that other factors are playing far more of a role in determining individual student grades. In a strange twist of irony, the outlier student who chose to leave every form blank for the entire semester also happened to be the only student who earned a perfect score on the exam.

Reflection

The handouts are collected and checked for attendance but not completion. A question had been lingering about whether to make completion mandatory on the handout, which would subsequently increase grading/prep time as a trade-off with potential improvements to student outcomes in areas like exam scores and overall grade. Based upon the results of the data analysis above, there does not currently exist a justification either for requiring completion of the

handouts, or for grading the handouts that are collected. A follow-up question might be to ask whether these handouts should continue being used in light of evidence that they don't lead to improvements in student outcomes as measured in grades. However, similar tools like the muddiest point experience widespread use within academia because there are a host of important goals we have as faculty above and beyond the grades earned in the course.

Creating the handout serves as a refresher for the lecture notes for the faculty, and helps organize the flow of conversation during the class. This intentional creation of discussion starters engages active learning goals and helps to create students with a shared responsibility for learning. The opportunity for students to write down their answers before speaking out in class helps to overcome passive resistance, reducing the fear of wrong answers and reprisals. The handout organizes ongoing, consistent feedback on student perceptions of lecture and discussion quality. Perhaps most importantly, continuing to offer this tool as an optional way for students to stay engaged and organize their notes speaks to the larger concept of neurodiversity, that each student has a unique set of needs in the classroom, and a wide variety of tools and ways to choose to engage with the content will help to meet everyone's individual needs.

Additional research could be conducted on this topic, but preliminary evidence suggests this is not necessary at this time. The tool provides an organization method to help students stay connected with class content and draw their attention to key concepts, but engagement with the tool is not found to be predictive of exam performance on related content. The practice community is anticipated to benefit from this paper through the introduction of the Talking Points framework for handouts which could have widespread application. In contrast for the research community, this paper can serve as an example of integrating pedagogical theory and practice and documenting how disparate concepts can come together to provide the underpinnings for what might otherwise be a simple classroom handout.

Considerations in a Time of Pandemic

The ways in which faculty and students interact experienced a fundamental shift with the beginning of the Covid 19 pandemic in March of 2020. For the author of this paper, campus closed with short notice, and instructors were told to switch to online methods of instruction, with minimal preparation or training for using online tools. The decision to provide synchronous instruction or switch to asynchronous was left up to individual faculty, as was all decisions about delivery of the classroom content and the extent to which the original content of the class would be fully applied. With many students traveling internationally and a great deal of uncertainty for everyone in the spring of 2020, the classes which had been using the talking points handout up until March ultimately went asynchronous, with lectures being recorded and posted for students to watch at their convenience. The talking points documents became a guide for how to split lectures up into smaller pieces, recording a series of 3-6 minute videos rather than one extended lecture. Each of these videos was then afforded a space for discussion on that mini-lecture in Microsoft Teams, the online LMS used for delivery. Interactive engagement with these mini-

lectures remained low through the end of the semester, while student engagement with homework and projects continued largely unchanged from their typical levels.

The talking points handout remains on hiatus in the 2020/2021 academic year, with in-person attendance in the classroom strictly limited by social distancing restrictions. With effectively 2/3 of the class receiving synchronous but remote instruction on any given day, the logistics of utilizing the handout have been too much to overcome for the level of benefit that it provides. It is now used solely as a tool for preparation before a class period, and occasionally the discussion prompts have been transferred as text boxes to particular lecture slides. Reflection will be needed about the role of this engagement tool going forward, along with a suite of considerations for long-term impacts to instruction as a result of the pandemic.

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