

Constructivist Approaches and Pedagogical Reform in Icelandic Financial Education

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Abstract

This study reconceptualizes a comparison of traditional versus active learning methods in a university finance course through a constructivist theoretical framework. We conduct a randomized controlled trial in a *Finance I* course at the University of Iceland, contrasting a conventional lecture-based review session with an active learning session using the Think-Pair-Share (TPS) technique. Grounded in constructivist pedagogy and Nordic education reform ideals, we hypothesize that the collaborative, student-centered approach will enhance learning. Students were randomly assigned to a 40-minute exam review delivered either as a traditional lecture or via TPS-based active learning, under blinded conditions. Learning outcomes were measured by performance on subsequent exam questions. Contrary to expectations from constructivist theory and prior active-learning research, results show no significant difference in exam performance between the active learning and lecture groups. We discuss these findings in the context of constructivist learning theory, implications for educational innovation, and curriculum development within Iceland's higher education system. The study contributes to the dialogue on pedagogical reform in Nordic financial education by highlighting both the potential and challenges of implementing constructivist-aligned teaching practices.

Keywords

Constructivist learning theory; Active learning; Think-Pair-Share; Financial education; Curriculum reform; Nordic education

Introduction

In recent years, educational reform movements worldwide have increasingly advocated for a shift from traditional, teacher-centered instruction to active, student-centered learning approaches grounded in constructivist theory (Bada, 2015; Saarsar, 2018; Shah, 2019). Constructivist pedagogy holds that

learners actively construct knowledge by integrating new information with their existing cognitive frameworks, rather than passively receiving content (Piaget, 1970; Vygotsky, 1978; Bada, 2015). This theoretical framework has given rise to a range of active learning strategies that emphasize learner engagement, peer collaboration, and reflective thinking to enhance deeper understanding (Anthony, 1996; Grijpma et al., 2023). Think-Pair-Share (TPS) and similar interactive learning techniques exemplify how classroom practices can support the development of understanding through structured peer dialogue and collaborative problem-solving, consistent with the principles of social constructivism (Lyman, 1981; Johnson, Johnson, & Smith, 1991). These methods foster student agency and allow learners to articulate and refine their thinking through interaction with peers, aligning with Vygotsky's (1978) view of knowledge construction within a social context. The broader literature on active learning strongly supports its efficacy. A comprehensive meta-analysis by Freeman et al. (2014) found that students in active learning environments outperformed those in traditional lecture-based classes, both in terms of examination scores and course completion rates. These outcomes substantiate the constructivist perspective that deeper cognitive processing, especially when combined with peer engagement, enhances student learning outcomes.

The push for constructivist-aligned pedagogy is also evident in contemporary education policy and practice across the Nordic region. Iceland, in particular, has cultivated a strong tradition of educational progressivism, emphasizing inclusive practices, autonomy in teaching, and responsiveness to student needs (Saarsar, 2018; Jóhannesson et al., 2002). Over recent decades, Icelandic educational discourse has increasingly promoted active learning, collaborative pedagogies, and school-based curriculum development, signaling a clear shift toward constructivist teaching and learning approaches (Jóhannesson et al., 2014). These priorities are formally embedded in strategic documents such as Iceland's Education Policy 2030, which outlines the goal of developing a "dynamic and flexible education system" that fosters economic and social development through critical thinking, lifelong learning, and student engagement (OECD, 2021). Within higher education, this agenda translates into growing interest in pedagogical reform aimed at making instruction more interactive, student-centered, and aligned with global innovations in active learning (European Educational Research Association [EERA], 2023).

Despite robust theoretical and policy support for active learning, there remains a need for more empirical evidence regarding its effectiveness across specific academic disciplines and institutional contexts (Prince, 2004; Bada, 2015). This is particularly true in business and finance education, which has traditionally relied on lecture-based teaching and quantitative problem-solving methods (Thomas, 2009; Harris & Bacon, 2019). These domains often emphasize content coverage and numerical accuracy, potentially creating tension with the dialogic, student-driven practices promoted in active learning frameworks. As such, business and finance classrooms provide a critical testing ground for evaluating the feasibility and impact of constructivist-inspired pedagogical innovations. In the University of Iceland's *Finance I* course (an introductory finance class), we identified an opportunity to rigorously compare traditional lecturing with an active learning intervention using TPS. By embedding this comparison in a randomized controlled trial (RCT) under real classroom conditions, our aim is to evaluate whether the constructivist-inspired approach measurably enhances student learning outcomes in a Nordic higher education setting. The study also speaks to the broader agenda of curriculum development: if active learning proves beneficial (or at least not detrimental) to learning in finance, it can inform course design and faculty development initiatives, both in Iceland and internationally.

This article is in some sense related to a prior study on traditional vs. active learning methods in financial education, but this research is framed explicitly through the lens of constructivist pedagogy and educational reform. We first review relevant literature on constructivist learning theory, active learning strategies, and their implementation in higher education, especially within Nordic contexts. We then describe the methodology of the RCT conducted in the finance course, followed by the results of the intervention. In the discussion, we interpret the findings in light of constructivist principles and consider implications for teaching practice, policy, and ongoing pedagogical innovation. Our goal is to contribute to scholarly and practical conversations about how best to align teaching methods with contemporary theories of learning and the needs of 21st-century learners.

Literature Review

Constructivist Learning Theory and Active Learning

Constructivist learning theory provides the foundational framework for this study. Emerging from the works of Piaget (1970) and Vygotsky (1978), constructivism posits that knowledge is not passively received but actively constructed as learners integrate new concepts with existing cognitive structures. Within a constructivist classroom, the instructor's role evolves from that of a knowledge transmitter to a facilitator who designs learning environments that support inquiry, critical thinking, and reflective engagement (Bada, 2015; Bonwell & Eison, 1991). Social constructivism further emphasizes that learning is a socially mediated process in which dialogue and collaboration with peers and teachers help students co-construct understanding, particularly within what Vygotsky termed the Zone of Proximal Development (Vygotsky, 1978; Johnson, Johnson, & Smith, 1991). Accordingly, the use of language, peer discussion, and collaborative activities is regarded as essential to promoting deeper, more meaningful learning experiences (Anthony, 1996; Saarsar, 2018).

Active learning pedagogies are a natural extension of constructivist learning theory, which emphasizes that students learn best by actively engaging in constructing meaning rather than passively receiving information (Piaget, 1970; Vygotsky, 1978; Bada, 2015). Rather than positioning students as recipients of knowledge, active learning strategies require them to participate in doing, discussing, and reflecting as central mechanisms for constructing understanding (Bonwell & Eison, 1991). Bonwell and Eison (1991) define active learning as “instructional activities involving students in doing things and thinking about what they are doing,” emphasizing both physical activity and cognitive engagement. Such approaches focus on developing critical skills—such as analysis, synthesis, and evaluation—over simple content delivery, often encouraging learners to explore their own attitudes and values in the learning process (Prince, 2004). Examples of active learning range from brief discussion breaks and pair work to structured case studies and problem-based learning sessions. A cross these strategies, the unifying theme is the promotion of higher-order thinking and student autonomy (Anthony, 1996; Johnson, Johnson, & Smith, 1991).

Empirical research strongly supports the efficacy of active, constructivist-aligned pedagogies in higher education. In a widely cited meta-analysis of 225 studies across science, technology, engineering, and

mathematics (STEM) disciplines, Freeman et al. (2014) found that average exam scores were approximately 6% higher in courses using active learning compared to traditional lecture-based instruction. Moreover, students in lecture-only classes were found to be 1.5 times more likely to fail than their peers in active learning environments. These findings provide compelling evidence that engaging students in interactive, cognitively demanding tasks enhances academic outcomes. From a theoretical perspective, active learning reinforces knowledge retention and understanding by requiring students to retrieve, apply, and explain concepts—processes that align with constructivist views of learning as an active, meaning-making endeavor (Bonwell & Eison, 1991; Prince, 2004). Active methods also often incorporate collaborative learning structures, enabling students to articulate reasoning, confront misconceptions, and refine understanding through peer interaction. This dynamic reflects Vygotsky's (1978) theory of socially mediated learning, in which knowledge is co-constructed through language and guided interaction within the learner's zone of proximal development.

Think-Pair-Share (TPS) is a representative technique that exemplifies the principles of constructivist, active learning. Originally introduced by Frank Lyman in 1981, TPS involves a structured sequence in which students first reflect individually on a question or problem, then engage in peer discussion, and finally share their insights with the larger class (Lyman, 1981). This method fosters active participation and encourages all learners to process and articulate their thinking, thereby supporting both individual reflection and social construction of knowledge (Johnson, Johnson, & Smith, 1991; Vygotsky, 1978). TPS has been found to increase cognitive engagement, improve verbal expression, and enhance conceptual understanding across diverse learning contexts (Abiodun et al., 2022; Crouch & Mazur, 2001). Research on TPS and related cooperative learning techniques consistently indicates multiple educational benefits, including improved retention, motivation, and collaborative skills—outcomes that align with the goals of learner-centered pedagogy rooted in constructivist theory (Bonwell & Eison, 1991; Prince, 2004).

The Think-Pair-Share (TPS) strategy incorporates structured “think time,” which has been shown to enhance the quality of student responses by allowing learners sufficient cognitive space to formulate and refine their ideas (Lyman, 1981; Bonwell & Eison, 1991). This structure fosters individual accountability, as each student is expected to contribute to the peer discussion and be prepared to articulate their understanding. The

collaborative phase enables students to clarify concepts, confront misunderstandings, and connect new information to prior knowledge through socially mediated dialogue (Johnson, Johnson, & Smith, 1991; Vygotsky, 1978). In this way, TPS operationalizes core elements of constructivist pedagogy by engaging students in active processing and using peer interaction as a vehicle for constructing knowledge (Anthony, 1996; Abiodun et al., 2022). It illustrates how even modest adjustments to instructional technique can transform a traditionally passive review session into a participatory, student-centered learning experience aligned with contemporary theories of learning.

Educational Reform and Nordic Context

The movement toward active, student-centered learning is grounded not only in educational theory but also increasingly reflected in policy frameworks, particularly within the Nordic countries. Iceland's education system—like those of its regional counterparts—has undergone significant reform over the past several decades, emphasizing egalitarianism, inclusion, and pedagogical innovation (Jóhannesson et al., 2002; OECD, 2021). Since the late 20th century, Icelandic educational discourse has promoted themes such as mixed-ability grouping, hands-on learning, project-based work, peer collaboration, and thematic instruction—all of which align with constructivist learning principles and active pedagogical approaches (Jóhannesson et al., 2014). A key feature of this reform has been the transition toward school-based curriculum development and away from highly centralized content mandates, thereby empowering educators to tailor instruction to local needs and student diversity (Saarsar, 2018). These developments mirror a broader international recognition that traditional lecture-based models are insufficient for fostering the higher-order thinking, problem-solving, and adaptability required in contemporary societies (Prince, 2004).

A notable recent development in Icelandic education is the introduction of the *Education Policy 2030*, a strategic vision endorsed by the Icelandic Parliament in 2021. According to an evaluation by the OECD, this policy aims to foster a “dynamic and flexible education system to drive economic and social change,” underpinned by values such as resilience, courage, knowledge, and happiness (OECD, 2021; EERA, 2023). Realizing such a vision necessitates ongoing pedagogical innovation. For an education system to be both dynamic and flexible, it must adopt instructional methods

that can respond to diverse learner needs and an evolving knowledge economy. Constructivist and active learning approaches are well-suited to meet this challenge, as they promote adaptability by encouraging students to learn how to learn—developing metacognitive skills, critical thinking, and collaborative competence rather than merely absorbing static content (Bonwell & Eison, 1991; Prince, 2004). In line with this policy direction, Icelandic universities are increasingly encouraged to move beyond the traditional lecture model toward more interactive, student-centered teaching that reflects these values and goals (Jóhannesson et al., 2014).

Despite strong theoretical and policy support, the implementation of constructivist pedagogy in higher education presents several challenges. Faculty members—particularly in content-heavy disciplines such as finance—are often accustomed to traditional lecturing methods and may be hesitant to adopt new approaches without compelling evidence of improved learning outcomes (Henderson et al., 2011). Similarly, students may resist active learning strategies, especially when these deviate from their expectations of conventional classroom instruction that prioritizes passive note-taking and instructor-led explanations (Weimer, 2002). Practical considerations such as class size and instructional resources also influence implementation. Although active learning has demonstrated effectiveness across various educational contexts, its strongest effects are often observed in smaller class settings, where instructors can more readily facilitate meaningful peer interaction and monitor engagement (Freeman et al., 2014). Nonetheless, educational practice in the Nordic countries—including Iceland—is steadily evolving toward more constructivist, learner-centered models, driven by supportive policy frameworks and a broader cultural emphasis on educational equity and student autonomy (OECD, 2021).

Within the discipline of finance and economics education, empirical research on active learning has begun to emerge, though it remains less extensive than in the STEM fields where such pedagogies are most studied (Prince, 2004; Freeman et al., 2014). Nevertheless, recent studies in business education have shown promising results. Active learning techniques have been found to improve student engagement and often result in learning outcomes that are equal to or superior to those achieved through traditional lectures (Harris & Bacon, 2019; Thomas, 2009). For example, Harris and Bacon (2019) reported that incorporating active learning strategies into economics instruction produced results “at least as good as” conventional approaches, while also fostering both lower-order and higher-order

cognitive skills. Importantly, even when gains in test performance are modest, active learning has been shown to offer ancillary benefits such as improved student attitudes, greater classroom participation, and reduced attrition rates (Weimer, 2002). These broader outcomes are especially relevant to educators and policy-makers, as success in higher education is increasingly being evaluated not only through assessment scores but also through student motivation, retention, and the cultivation of lifelong learning competencies. Evaluating active learning in the context of a finance course at the University of Iceland therefore contributes not only to the evidence base for pedagogical reform but also to its alignment with the long-term goals of Icelandic education policy.

In summary, the literature and policy context provide strong motivations for experimenting with active, constructivist teaching methods in financial education. Constructivist theory suggests that approaches like TPS should deepen learning by engaging students actively in the construction of knowledge. Education reforms in Iceland and similar contexts encourage such innovations to create a more effective and responsive education system. The mixed evidence about the impact of active learning in higher education—ranging from significantly positive results to occasional null findings—underscores the importance of context-specific research. This study builds on these foundations to examine, in a rigorous way, what difference a constructivist-aligned teaching approach might make in an Icelandic finance classroom.

Methods

Course Context and Participants

The study took place in an undergraduate *Finance I* course at the University of Iceland, during the academic year 2024–2025. The course is a core requirement for business and economics students, covering fundamental concepts in corporate finance and financial analysis. Enrollment in the course was approximately 120 students, primarily second-year undergraduates.

All students enrolled in the course were eligible to participate in the study. Students were informed that a special review session would be held prior to an upcoming exam and were invited to attend, but they were not initially aware that two different teaching methods would be used as part of a research experiment (to minimize performance bias). Participation in the review and study was voluntary, and students provided informed consent for their exam data to be used in research analysis, with assurances of confidentiality.

Experimental Design

We employed a randomized controlled trial (RCT) design to compare two instructional methods for delivering an exam review session: **Traditional Lecture** and **Active Learning (Think-Pair-Share)**. Students were randomly assigned to one of two groups. Randomization was done at the individual level using a random number generator, stratified by prior course performance (based on continuous assessment scores) to ensure that each group had a similar distribution of academic ability. The two groups were scheduled to attend review sessions in separate classrooms at the same time, with the same instructor (one of the authors) involved in both sessions. Importantly, the experiment was conducted under **blinded conditions** in the sense that students did not know that alternative teaching methods were being studied (they only knew they were attending a review), and the teaching assistant who helped grade the exams was not informed which students had experienced which review method.

The content covered in both review sessions was identical, focusing on key topics likely to appear on the exam (e.g., time value of money calculations, basic stock and bond valuation problems, and conceptual questions from recent lectures). The total duration for each session was 40 minutes, consistent with the typical length of a class period. The only difference was the mode of instruction:

- **Traditional Lecture Session (Control):** In this session, the instructor delivered a conventional lecture-style review. This involved summarizing important concepts, walking through example problems on the board, and reviewing key formulas. The instructor led the session talking approximately 90% of the time, with occasional brief opportunities for students to ask clarification questions. Students in this condition mainly listened, took notes, and responded to a few direct questions from the instructor, but there were no structured interactive activities among students.
- **Think-Pair-Share Session (Active Experiment):** In this session, the instructor facilitated an active learning review using the TPS method. At the start, students were presented with a finance problem or concept question and given a short period (about 1–2 minutes) to **think** individually and jot down their approach or answer. Next, students were instructed to **pair** up with a neighbor to discuss their thoughts and compare answers for a few minutes. During this time the instructor circulated around the room, listening to discussions and providing hints or prompts as needed. Finally, the instructor called on several pairs to **share** their answers or reasoning

with the whole class, leading to a full-class discussion. The instructor clarified any misconceptions revealed during sharing and provided the correct solutions or explanations. This TPS cycle was repeated multiple times (covering different topics or problem types) within the 40-minute session. Through this process, every student had the opportunity to articulate their understanding and learn from a peer, making the session highly interactive.

Both sessions were conducted on the same day, one immediately after the other, to avoid any advantage of timing (e.g., one group receiving the review earlier and having more study time). Students only attended the session to which they were assigned and were asked not to discuss the session content with peers from the other group until after the exam, ensuring that each group's learning experience was contained.

Measures and Data Collection

The primary outcome measure was student performance on the exam, specifically on the content areas that were emphasized during the review session. The exam was a comprehensive test covering all recent topics in the course, administered to all students in *Finance I* (regardless of whether they attended the review). It included a combination of multiple-choice questions and quantitative problem-solving task. Within this exam, we identified a subset of questions (both quantitative problems and conceptual questions) that directly corresponded to the material reviewed in the sessions.

After the exam, students' answer sheets were collected and graded. To preserve the blind conditions of the study, the exam papers were coded anonymously such that the grader (a teaching assistant) did not know which review session each student had attended. The primary researchers later matched the codes to the experimental groups for analysis. The grading followed the course's standard rubric, and both the instructor and teaching assistant cross-checked a sample of answers to ensure consistency in scoring.

Data Analysis

To determine the impact of the teaching method on exam performance, we compared the exam scores between the two groups. The primary analysis focused on the subset of exam questions related to the review topics. For each student, we calculated the percentage of points earned on these targeted items. We then computed the mean percentage score for the Lecture group and the TPS group. An independent-samples t-test was conducted to assess

whether the difference in means between the two groups was statistically significant. We checked assumptions of the t-test (normality and homogeneity of variances) by examining score distributions and using Levene's test for equality of variances.

We also computed effect size (Cohen's d) for the difference between the lecture and TPS groups on the targeted questions, to evaluate the practical significance of any observed differences. In addition, as a secondary analysis, we compared the overall exam scores between groups (covering all questions on the exam) to see if the review method had any general influence on performance beyond the specific reviewed content.

Survey responses were analyzed descriptively. We compared the average engagement and usefulness ratings between the lecture and TPS groups, and we read through the open-ended feedback to identify common themes or notable comments. We did not perform statistical tests on the survey data, given the small scale and the qualitative nature of much of it, but we use it in the Results and Discussion to provide context.

All quantitative analyses were performed using standard statistical software (e.g., Excel and SPSS). A significance level of $\alpha = 0.05$ was used for hypothesis testing. The following section reports the results of the experiment, integrating both the objective exam performance data and relevant observations from the surveys and classroom.

Results

Exam Performance Outcomes

A total of 110 students attended one of the two review sessions and took the mid-term exam (out of 120 enrolled in the course, reflecting a high participation rate in the study). Of these, 55 students were in the **Traditional Lecture** group and 55 in the **TPS Active Learning** group (some students who initially signed up did not attend, resulting in equal final group sizes). The key finding from the exam data is that **there was no significant difference in learning outcomes between the two teaching methods**. In other words, students who received the review via active learning performed **about the same** on the exam as those who received a traditional lecture review.

For the subset of exam questions that pertained to the reviewed topics, the mean score in the Lecture group was $M = 78.4\%$ ($SD = 12.1$), while the mean score in the TPS group was $M = 79.6\%$ ($SD = 11.3$). This difference of about 1.2 percentage points in favor of the TPS group was not statistically

significant ($t(108) = 0.52, p = 0.604$). The 95% confidence interval for the difference between means was approximately $[-3.6\%, +6.0\%]$, indicating that any true difference in performance could be slightly negative or positive, but is likely small. The effect size was Cohen's $d = 0.10$, which is considered **negligible** in educational research terms. Essentially, both groups demonstrated very similar levels of achievement on the material that was reviewed, despite the divergent teaching methods used.

Looking at **overall exam scores** (not just the targeted questions), the results were consistent. The Lecture group's average total exam score was $M = 74.1\%$ ($SD = 15.0$), and the TPS group's average was $M = 75.3\%$ ($SD = 14.5$). This ~ 1.2 percentage point difference was not statistically significant ($p > 0.5$). The distribution of grades (e.g., the percentage of students achieving A, B, C, etc.) was virtually the same in both groups. Approximately 90% of students in each group passed the exam, and the top 10 scores on the exam included students from both conditions in roughly equal measure.

These quantitative findings support the conclusion that the TPS-based active review session did **not** lead to a measurable improvement in short-term exam performance compared to the traditional lecture review in this context. Notably, however, the active approach did not *hurt* performance either; the outcomes were essentially equivalent by the metrics of the exam.

Student Engagement and Perceptions

While exam scores capture the end result of learning, the experience of the sessions and students' perceptions provide additional insight into the impact of each method. Key observations and feedback in engagement include that the TPS session was far more interactive and participatory by design. Observation during the active session indicated that the vast majority of students (roughly 90%) were actively talking during the pair discussions at some point. The classroom buzzed with conversation as students worked through problems together. In contrast, during the lecture session, student engagement was mostly passive; only a handful of students (estimated at under 10%) spoke up to ask or answer questions in the whole-class format. Most lecture participants listened quietly and took notes, as is typical in a lecture environment.

In summary, even though the **exam outcomes** were similar, the **process** of learning in the two conditions was markedly different. The TPS active learning approach achieved much higher student engagement and was

perceived as more interactive and confidence-building, whereas the traditional lecture was familiar, efficient in coverage, but largely passive for learners. The experiential and participatory nature of active learning is often cited as a key contributor to improved classroom dynamics and student motivation. Such qualitative dimensions are increasingly viewed as critical indicators of educational success, particularly in systems that emphasize holistic development and lifelong learning. The implications of these observations are further explored in the discussion section of this study.

Discussion

Interpretation of Findings through a Constructivist Lens

The absence of a significant performance difference between the TPS-based active learning session and the traditional lecture session in our study is an intriguing finding, especially in light of strong theoretical reasons to expect an advantage for active learning. From a constructivist perspective, one might hypothesize that the TPS method, by actively engaging students in processing information and articulating their understanding, would lead to superior learning outcomes compared to a passive lecture. Our results did not show this superiority in terms of exam scores. Several potential explanations emerge:

- **Depth versus Breadth of Learning:** It is possible that the TPS session promoted deeper conceptual understanding among students that was not fully captured by the exam questions, which focused on obtaining correct answers to specific problems. Constructivist theory suggests that active engagement should facilitate deeper learning. However, the benefits of that depth might not translate into higher scores if the exam primarily tests procedural knowledge or if both groups could reach the correct answers by different paths. In other words, the TPS students might have developed a richer understanding or greater confidence, even if the lecture students managed to get the same questions right by memorizing procedures. If we had assessed higher-order thinking or the ability to explain concepts in writing, perhaps differences would have emerged.
- **Duration and Intensity of the Intervention:** Our active learning intervention was brief – a single 40-minute session – embedded in a course that otherwise was primarily lecture-based. Students in both groups had the same prior instruction throughout the semester; we only varied the method for the review. It may be that one isolated active learning experience is insufficient to produce measurable gains in performance. Many of the

benefits associated with constructivist pedagogy—such as the development of critical thinking, metacognitive awareness, and self-regulated learning—are cumulative and may not fully manifest in short-term assessments. Instead, these outcomes are more likely to accrue over time through sustained engagement and repeated practice within active, student-centered environments (Weimer, 2002; Prince, 2004). This temporal dimension highlights the importance of integrating constructivist approaches consistently across courses and curricula to foster durable learning gains and deeper intellectual growth. Consequently, short-term performance metrics may underestimate the transformative potential of constructivist pedagogy, especially in higher education settings where long-term competence and adaptability are key educational goals (Bonwell & Eison, 1991). Thus, if active learning were implemented throughout the course (rather than just once), the cumulative effect might have led to differences in outcomes. Our study's result might reflect the reality that enduring change in learning often requires sustained pedagogical innovation, not one-off activities.

- **Content Difficulty and Novelty:** The review covered content that students had already learned (to some degree) in prior classes. Both groups were reviewing and practicing known topics. Active learning tends to yield its strongest effects when students are introduced to new concepts or actively working to resolve misconceptions, as these contexts demand deeper cognitive engagement and facilitate conceptual change (Freeman et al., 2014; Prince, 2004).

- In our case, students had been exposed to the material before, and the review was more about reinforcement. It could be that by the time of the review, many students in both groups had already constructed a basic understanding of the topics. The lecture might have been sufficient to jog their memory and highlight key points, while TPS provided practice and clarification. If we had introduced entirely new content in these sessions, the active approach might have had a clearer edge, as it could facilitate the initial construction of knowledge more effectively than lecture.

- **Assessment Alignment:** There is a known principle in education that alignment between teaching methods and assessment type is crucial. Our exam was a traditional one with quantitative and short-answer questions that had definitive correct answers. The lecture session was well-aligned with this format: the instructor essentially worked through similar problems and solutions. The TPS session, on the other hand, emphasized student discussion and reasoning. It's possible that the active session would have

better prepared students for an assessment that required explanation of reasoning or application of concepts to novel scenarios, while the lecture directly prepared students for solving routine problems like those on the test. In other words, both groups might have been well-prepared *for the type of exam they were given*, resulting in similar scores. If we consider broader learning outcomes (like ability to communicate financial reasoning or collaborate on solving a complex problem), those were not measured by our exam but could be areas where the active group gained more.

- **Student Adjustment and Buy-in:** The novelty of the Think-Pair-Share (TPS) method may have influenced its effectiveness in this study. For many students, this may have been their first experience with structured peer discussion in a university setting, which could have led to initial uncertainty about how to collaborate effectively or hesitancy in fully engaging due to shyness or unfamiliarity. While survey feedback generally reflected positive attitudes toward the method, it is plausible that not all students participated actively, thereby attenuating the potential benefits of the approach. In contrast, the lecture format is well-established and culturally familiar; students understand its norms and are accustomed to strategies such as note-taking and passive listening to extract key information (Weimer, 2002). Over time, with increased exposure to active learning, students may develop the confidence, skills, and metacognitive strategies necessary to thrive in more participatory environments, potentially resulting in greater learning gains (Henderson et al., 2011). These observations underscore that pedagogical innovation also entails a cultural shift in higher education—both instructors and students must adapt to new roles and expectations in an active learning classroom (Prince, 2004).

- **Random Variation and Sample Size:** Finally, we must consider the possibility that there truly is little or no difference in this specific context, or that our study was not large enough to detect a subtle difference. With 55 students per group, our statistical power was sufficient to detect a moderate effect, but a very small benefit (e.g., a 2-3 percentage point improvement) could go undetected. The fact that the TPS mean was slightly higher (79.6% vs 78.4%) suggests if there is any trend, it leans towards active learning, but it is so small that we cannot be confident it's a real effect and not just chance. It is worth noting that prior research has occasionally reported no significant differences in exam performance between students in active learning and traditional lecture-based sections, particularly in short-term interventions or single-topic instructional comparisons (Deslauriers et al., 2019; Prince,

2004). These findings suggest that the benefits of active learning may depend on the duration of exposure, the nature of the material, and the degree of student familiarity with the instructional format. Our findings add to those cases, underlining that the impact of active learning can vary and is not universally large in every instance.

In sum, our results do not overturn the premises of constructivist learning theory, but they do suggest that the translation of constructivist advantages into quantifiable exam gains is complex. The TPS method clearly succeeded in engaging students actively (as intended by the theory), and yet that engagement did not manifest as superior test performance in the conditions of our study. This indicates that **active learning can perform at least as well as lecturing** in terms of traditional academic outcomes, which is an important point: even when it doesn't boost scores, it maintains them while providing other benefits. This observation aligns with research syntheses that conclude active learning typically results in student performance that is either equivalent to or better than that achieved through traditional lectures—and only rarely worse (Freeman et al., 2014; Prince, 2004). These consistent findings across disciplines reinforce the pedagogical value of active engagement, even when performance gains are modest or context-dependent. In our case, equivalence is not a negative result; it means instructors can adopt a constructivist approach like TPS without fear of harming short-term achievement, and potentially gain benefits in student engagement and satisfaction.

Implications for Educational Innovation and Policy

Situating these findings in the context of educational innovation and policy, particularly within Iceland and similar educational systems, yields several insights:

- **Curriculum and Course Design:** The lack of a performance difference suggests that simply inserting an active learning session into an otherwise traditional course may not be enough to see measurable gains. For curricular reformers, this underscores the need for a more holistic integration of constructivist methods. If the goal is to improve learning outcomes through active learning, courses might need to be redesigned so that interactive engagement is a regular feature, not an isolated event. For instance, the Finance I course could incorporate TPS or other active techniques in every class or weekly recitation sessions, gradually building students' collaborative problem-solving skills alongside content knowledge. Such sustained

implementation of active and constructivist pedagogy may better align with the objectives articulated in Iceland's *Education Policy 2030*, which emphasizes the creation of a dynamic and flexible education system designed to foster innovation, adaptability, and lifelong learning (EERA, 2023). Embedding these pedagogical practices as a consistent feature of instruction—rather than as isolated interventions—ensures that educational innovation becomes a core component of the learning process.

- **Faculty Development and Support:** The experiment highlights that while active learning is promising, its success depends on effective execution and teacher confidence. University instructors who are used to lecturing might need training and support to implement methods like TPS effectively. Institutional policies could encourage or require faculty development programs focused on active learning strategies, possibly drawing on the expertise of teaching and learning centers. Additionally, sharing of best practices among faculty (for example, finance professors exchanging tips on how to run a successful discussion on complex problem sets) can help improve outcomes. If an instructor's first attempt at active learning doesn't produce evident gains, they should be encouraged to refine the approach rather than abandon it. Here, policy can play a role by incentivizing innovative teaching and recognizing efforts through teaching awards or consideration in promotion criteria.

- **Student Orientation and Expectations:** For educational innovation to work, students might also need orientation. Many university students have spent their prior education mostly in teacher-directed environments. Introducing constructivist approaches at the university level may require explaining *why* these methods are being used and how they benefit student learning. Orientation sessions or course syllabi could include statements about the importance of active participation, and first-class activities could acclimate students to speaking up and collaborating. If students see active learning as an intentional, research-backed approach rather than an anomalous classroom experiment, they may engage more earnestly, which in turn would likely improve the efficacy of the method.

- **Assessment Practices:** Our findings raise the question of whether traditional assessment methods are adequately capturing the learning that constructivist approaches aim to foster. Education reform efforts may need to target not just teaching methods but assessment alignment. For example, if a course uses active learning to develop problem-solving and critical thinking, the assessments should perhaps include open-ended problems,

case analyses, or oral presentations, rather than relying solely on closed-form exams. In a finance curriculum, aside from quantitative exams, one could incorporate projects (like analyzing a real company's financial statements in teams) or reflection essays on decision-making processes. Such assessments would likely better reflect the benefits of constructivist learning experiences. Policy-makers and accreditors might support more diverse assessment strategies as part of a comprehensive improvement in educational quality.

- **Scaling and Policy Implementation:** For Iceland and other Nordic countries that are actively pursuing educational innovation, our study provides a cautious tale: not every innovation will immediately translate into higher test scores, but that doesn't mean the innovation lacks value. Policy documents often emphasize evidence-based methods (e.g., Iceland's education policy referencing quality and effectiveness). Our evidence suggests that implementing active learning requires commitment and possibly multiple iterations to bear fruit in measurable outcomes. Education leaders should take a long-term view. They can use findings like ours to refine their strategies—perhaps promoting active learning initially for its engagement benefits (which we clearly observed), while continuing to evaluate its impact on learning outcomes over time. Since our results show no harm and potential ancillary benefits, policies could confidently encourage active learning as part of a modern pedagogy, with the understanding that its full impact might be realized gradually.

- **Nordic Education Values:** The Nordic education model values not only academic achievement but also student well-being, cooperation, and democratic participation in learning. In this regard, the increase in engagement and the positive feedback from students in the TPS group is a success on its own. Students felt more involved and enjoyed the learning process. This aligns with the broader aims of fostering *lifelong learners* who are curious and capable of working with others. Thus, even if test scores remain the same, an active learning approach can be justified in policy terms by these qualitative improvements. Our findings can be used to reassure stakeholders that active methods do not sacrifice academic rigor; students can achieve the same results while gaining a more engaging and perhaps more meaningful classroom experience.

Limitations and Future Research

While our study offers valuable insights, it is important to acknowledge its limitations and suggest directions for future research:

First, the scope of this study was limited to one course (Finance I at a single institution) and one specific implementation of active learning. The generalizability of the results is therefore constrained. Different courses (even within finance, such as an advanced investments course or an economics theory class) might yield different results. Additionally, outcomes could vary at other universities or in other countries. Further studies could replicate this experiment in varied contexts to see if the pattern holds or if certain conditions produce a clear active learning advantage.

Second, our measure of learning was based on an exam conducted shortly after the intervention. This captures immediate learning of content. We did not assess long-term retention or the ability to transfer knowledge to new problems (beyond what the exam tested). Constructivist theory would predict that active engagement should improve retention and transfer. It would be insightful to include a follow-up assessment (for example, a surprise quiz a month later, or a component in the final exam covering the same material) to see if the TPS group retains knowledge better over time. If active learning's benefits are more evident in long-term retention, that could strongly argue for its adoption despite short-term parity in scores.

Third, we primarily used quantitative exam data to judge effectiveness. As our discussion highlighted, there are other educational outcomes of interest, such as student motivation, confidence, ability to communicate, and teamwork skills. Future research could employ a broader set of outcomes, perhaps including standardized concept inventories (to measure conceptual understanding independent of course exams) or qualitative assessments of student reasoning. For instance, interviewing students about a finance concept could reveal deeper understanding differences that a multiple-choice question might not show.

Fourth, the fidelity and quality of implementation of active learning can greatly influence results. Although we carefully planned the TPS session and observed high participation, there is always room to analyze *how* the interactions went. Were the peer discussions on-topic and accurate? Did every student truly engage or were some just passively listening to their partner? Detailed analysis of student conversations (perhaps by audio recording discussions with consent, or by having multiple observers) could shed light on the micro-level processes that lead to learning. Understanding these could help refine the technique (e.g., by training students how to effectively collaborate or by structuring the peer interaction more).

Additionally, while our instructor was experienced and tried to deliver both sessions effectively, instructors vary. Future studies might involve multiple instructors teaching parallel sections with lecture vs active methods, to see if instructor differences play a role or if results replicate across different teaching styles. This would enhance the robustness of the conclusions and provide insight into whether certain instructor traits (like enthusiasm or clarity) interact with teaching method.

Finally, connecting back to educational policy, it would be worthwhile to study how scaling up active learning (beyond a single classroom experiment) impacts a department or institution. For example, if an entire program in a business school shifted to active learning pedagogies, would we see improvements in overall student success, graduation rates, or satisfaction? Such large-scale studies are challenging but align with the interests of policymakers who must decide on broad reforms. Our study can be a starting point that informs these bigger efforts by highlighting the conditions under which active learning thrives or faces obstacles.

Conclusion

Reframing an investigation of teaching methods in financial education through a constructivist and policy-oriented perspective has allowed us to explore not just whether active learning *works*, but how it fits into the evolving landscape of education. In our randomized trial at the University of Iceland, we found that a constructivist-aligned approach (TPS active learning) led to **equivalent performance** on an exam when compared to a traditional lecture, despite providing a very different learning experience. This outcome underscores a critical point for educators and reformers: **innovations in pedagogy may demonstrate their value in ways beyond immediate test score gains**. In our case, the value came in the form of heightened student engagement, enthusiasm, and confidence—ingredients that are essential for cultivating effective, lifelong learners in accordance with modern educational goals.

From an academic standpoint, our findings contribute to a more nuanced understanding of the impact of active learning. They align with previous research suggesting that, at a minimum, active learning performs comparably to traditional lecturing, and at best, it yields superior outcomes in student engagement and achievement (Freeman et al., 2014; Prince, 2004). This reinforces the pedagogical argument for incorporating active strategies into higher education, even in fields traditionally dominated by lecture-based instruction. We did not witness a dramatic improvement in quantitative outcomes, which is a reminder that context matters. The benefits of

constructivist methods may emerge more strongly with different assessments, over longer durations, or in different subjects. For the domain of finance education, our study suggests that instructors can adopt interactive, student-centered techniques without fear of harming student achievement—and potentially gain much in student engagement.

For the Icelandic/Nordic educational context, this study offers practical insights aligned with the region's progressive ethos. It shows that simply adopting a trendy pedagogical approach is not a magic bullet; careful implementation and alignment are key. However, it also validates the direction of ongoing reforms: moving towards active, learner-centered classrooms is a sound strategy that can enrich education. Iceland's vision for a dynamic and flexible education system is supported by pedagogical approaches that foster more interactive and participatory classrooms—an aim exemplified by the use of Think-Pair-Share (TPS) in this study (EERA, 2023). By engaging students actively in dialogue and collaborative reflection, TPS operationalizes key elements of this policy framework and demonstrates how constructivist methods can contribute to national education goals. Achieving systemic change will involve scaling such practices, learning from each iteration, and continuously adapting—the very process of constructivist learning, but at the institutional level.

In conclusion, *Constructivist approaches and pedagogical reform in Icelandic financial education* represent both a challenge and an opportunity. The challenge lies in bridging the gap between high-level educational ideals and on-the-ground classroom outcomes. The opportunity is that, in doing so, we can create learning environments that not only convey knowledge, but also inspire and empower students. Our study's journey—from theoretical rationale to classroom experiment to reflective analysis—mirrors the path that many educators will traverse as they transform their teaching. It is our hope that this work will inform and encourage that journey, ensuring that future innovations in teaching are guided by evidence, contextual understanding, and a steadfast commitment to students' growth.

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