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VYTAUTO DIDŽIOJO UNIVERSITETO ŠVIETIMO AKADEMIJA

Traditional or Active Learning Methods in Financial Education? A Randomized Controlled Trial

Sigurdur Gudjonsson[1], Kari Kristinsson[2]

[1] University of Iceland, School of Business, 10-102 Sæmundargata St., Reykjavík, Iceland, siggig@hi.is
[2] University of Iceland, School of Business, 10-102 Sæmundargata St., Reykjavík, Iceland, karik@hi.is

Annotation. The purpose of this study is to compare how much students learn using two different teaching methods under blinded experimental conditions. That is, comparing traditional lectures to active learning. We measure student learning by varying teaching methods during a review for an exam, which was taught either through a 40-minute traditional lecture or a 40-minute session of active learning. The results suggest no difference in learning outcomes between students who received review through active learning and those who received review through traditional means.

Keywords: *randomized controlled trial, active learning, Think Pair Share.*

Introduction

Financial literacy helps individuals with knowledge to understand financial markets, manage investments, and make informed economic decisions, this goes not only for individuals but companies as well. (Custódio et al., 2024; Anderson et al., 2018; Bruhn & Zia, 2013; Drexler et al., 2014; Amagir et al., 2018; Haistings et al., 2013). The financial literacy knowledge enables individuals to contribute effectively to the economy, potentially guiding sustainable investment practices and promoting economic stability (Custódio et al., 2024; Anderson et al., 2018; Bruhn & Zia, 2013; Drexler et al., 2014; Amagir et al., 2018; Haistings et al., 2013).

Academic achievement, epitomized by grades, holds profound significance in educational contexts, reflecting students' mastery of subject matter and influencing their future trajectories. Early studies on the correlation between grades and job performance presented divergent findings, prompting nuanced discussions within academia (Harrell, 1969; Furnham & Cheng, 2024). While some researchers suggested a positive link, others highlighted complexities in this association (Bretz Jr., 1989). Despite debates, employers continue to value grades as indicators of candidates' potential, underscoring their role in shaping career prospects (Baird, 1985; Roth et al., 1996; Mehmetaj & Alili, 2021). Gender disparities in academic performance have also garnered attention, with women consistently outperforming men in various disciplines (Buchmann & DiPrete, 2006). Recent emphasis on active learning methodologies and peer collaboration signifies a paradigm shift in education, aiming to foster student engagement and achievement (Kaufman et al., 1997; Brownback & Sadoff, 2020).

The aim of this study is to compare how much students learn by using two different teaching methods under blinded experimental conditions. On one hand, there is traditional teaching; on the other hand, there is active learning. Research in education sciences suggests that active learning has a positive impact on students' learning (Bonwell & Eison, 1991; Borte et al., 2023). However, this method requires more time, reducing the coverage of course material in class (Cooperstein & Kocevar-Weidinger, 2004).

Literature Review

Grades are important indicator of learning

Academic grades are a measure of students' achievements. The importance of grades goes beyond the classroom; it affects individuals' future opportunities, such as professional gains. Early studies by Harrell (1969; 1970; 1972), Harrell et al. (1969), Furnham & Cheng (2024), found a positive correlation between average grades and job performance. However, subsequent research introduced nuances to this relationship, with findings indicating variations in the strength and direction of the correlation (Pfeffer & Langton, 1993; Mehmetaj & Alili, 2021). Bretz (1989) meta-analysis further complicated the discourse by revealing a lack of consistent association between university grades and subsequent job success.

Baird (1985) researched the importance of grades viewed for employers and found higher grades to increase candidates' chances of performing well in their professional life. Roth et al. (1996) provided empirical evidence supporting this notion, demonstrating a predictive relationship between grades and job performance, albeit with a relatively modest correlation coefficient. Furthermore, higher grades correlate with

increased earning potential and productivity over the course of individuals' careers (Furnham & Cheng, 2024; Mehmetaj & Alili, 2021).

Gender disparities in academic performance have also been a subject of interest within scholarly literature. Research consistently indicates that, on average, women tend to achieve higher grades than men across various academic disciplines and institutional settings (Buchmann & DiPrete, 2006; Mau & Lynn, 2000; Sonnert & Fox, 2012). While biological explanations have been proposed to account for these differences (Allik et al., 1999; Lynn, 1999), socio-economic factors also play a significant role (Underheim & Nordvik, 2006; Sammons, 1995). Women's higher work ethic and diligence in academic pursuits contribute to their academic success, with studies indicating that they invest more time in studying and preparation compared to their male counterparts (Mau & Lynn, 2000; Chee et al., 2005). In addition, women are more academically self-disciplined, resulting higher grades (Schunk et al., 2008).

Different Ways to Improve Learning

Cognitive training such as in mathematics improves academic performance, particularly for young children (Judd & Klingberg, 2021). Furthermore, compulsory schooling has been associated with positive health outcomes, resulting in better societal benefits for children, investing in education is therefore essential (Davies et al., 2018).

While traditional metrics like standardized test scores and student evaluations are commonly used to assess teaching quality, recent studies have emphasized the importance of peer effects in helping to reach good test results for students (Brownback & Sadoff, 2021; Duflo et al., 2011). In addition, researches on teacher-student relationships show positive interactions between instructors and students for better academic outcomes (Pianta et al., 2003).

Active learning and peer collaboration of students

Active learning methodologies and peer collaboration are contemporary teaching methods, but cooperative learning strategies have been shown to improve students' problem-solving skills, critical thinking, and motivation across different disciplines for quite some time (Kaufman et al., 1997). This is true for business education in particular (Hampton & Grudnitski, 1996; Siciliano, 2001; Stanley & Zhang, 2020).

Peer effects has been shown to improve students' academic achievements (Golsteyn et al., 2020). It improves the collaborative learning environment with knowledge exchange and increases skill among students. Furthermore, peer mentoring programs enhance both the mentor's and the mentee's academic outcomes (Topping, 2005).

Researchers have examined the impact of peer characteristics on individual academic outcomes, using quasi-experimental designs. Zimmerman (2003) researched peer effects in grades from Williams College and found students who got good grades had positive influence on their roommate and vice versa. Furthermore, collaborative

tasks may benefit work from a peer student but individual tasks do not (Sacerdote, 2001), i.e., peer collaboration and active learning methodologies improve students' academic performance.These methodologies can create an environment with a sense of belonging that will increase academic success (Hurtado & Carter, 1997).

Active learning and the method Think Pair Share

Active learning is a promising pedagogical approach that improves student academic performance across various disciplines. Below, we will focus on and review findings from a particular type of this methodology called Thing Pair Share, TPS.

It is important to note that active learning has been increasingly recognized as an effective tool for improving student results in academic studies. Such was the case for introductory biology courses, where Freeman et al. (2014) compared student performance between classes of traditional lecture and those using active learning, but those got both higher grades and were less likely to drop out from class.

Furthermore, Freeman et al. (2007) made a meta-analysis across science, engineering, and mathematics and they found that students in active learning classes did better than those who took traditional lectures. The average exam scores of those who took active learning classes increased by 6%. This active learning in improving student performance across STEM disciplines shows active learning is a good pedagogical approach to improve student's learning outcomes.

Moreover, Bligh (1998) looked at the effects of active learning on students' memory retention of course content. The students engaged in active learning showed better results compared to those students who were in passive learning environments.

While Prince (2004) carried out a meta-analysis of math students who got active learning, and they did better in problem-solving tasks, collaborative activities and they got better grades than those who got traditional lectures. Bonwell and Eison (1991) researched effect of active learning on student's motivation and engagement. They found cooperative learning within group, as well as case-based learning to improve student participation, engagement, and enthusiasm for learning. Their studies improves academic performance and student's satisfaction.

The Think-Pair-Share (TPS) method we use in this research is not only workable active learning teaching method but also an accepted one. For example, Crouch and Mazur (2001) researched the impact of TPS on critical thinking skills in a college biology course and found it a great improvement if compared to traditional classes with a lecture. Their study demonstrated that TPS activities encouraged active engagement and discussion, facilitating deeper understanding and analysis of course material (Crouch & Mazur, 2001). TPS has also been shown to increase student accountability and self-confidence, as students are encouraged to contribute to discussions and work collaboratively with peers (Felder et al., 2000).

Similarly, the social nature of TPS also helps to alleviate feelings of isolation that can occur in large classrooms, fostering a more inclusive and supportive learning environment (Johnson et al., 2009).

In another study, Johnson et al. (2009) used Tink Pair Share in a psychology course to improve student's engagement in learning. They found TPS to improve active participation and collaboration among the students. That resulted in deeper conceptual understanding better overall. These students had greater satisfaction and more benefits by using TPS (Johnson et al., 2009).

Abiodun et al. (2022) examined the effectiveness of TPS in improving achievement in mathematics among secondary school students. Their study demonstrated that students engaged in TPS activities exhibited higher levels of achievement compared to those in traditional instruction settings. TPS promoted collaborative learning and active engagement, resulting in improved problem-solving skills and mathematical understanding (Abiodun et al., 2022).

While active learning and the effectiveness of Think-Pair-Share have been shown to enhance student engagement and learning outcomes across various educational contexts, the increased interactivity and collaboration inherent in TPS are also aligned with the growing trend of student-centered learning environments, which have been shown to improve overall academic performance in both large and small classrooms (Freeman et al., 2014). It can be argued that preparing students with these methods will result in increased grades.

Method

To test our hypothesis that active learning improves student grades, a randomized controlled trial (RCT) was utilized. In the social sciences, RCTs are important for investigating causal effects in real-world settings. Another benefit of RCTs is that they generally have good external validity. For education research the use of RCTs is especially important. As education is a complex process with many variables, causal inferences and external validity can be particularly challenging. In light of this, RCTs can help to provide novel insights into the effectiveness of various teaching methods.

Participants and Intervention

To investigate the effects of active learning, specifically the Think-Pair-Share (TPS) method, on academic performance, a field experiment was conducted in the course Finance I at the University of Iceland. The assessment in Finance I consists of three exams over the semester. In this experiment, two of the exams were used to assess the impact of TPS on academic outcomes. The first exam was used to assess whether random assignment to experimental and control groups was successful (see Figure 1).

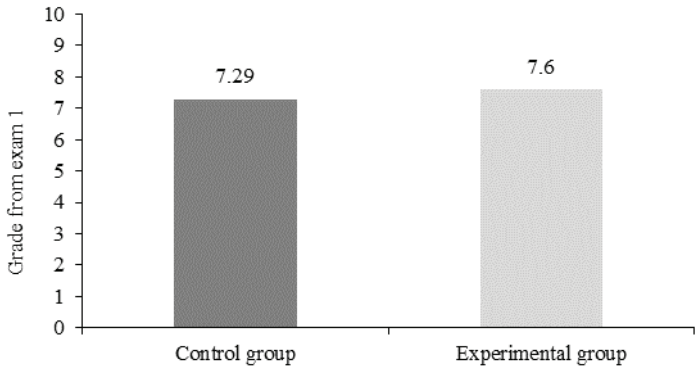
The second exam was then used to evaluate the effect of teaching with TPS methods on students' academic performance. In total, 117 students participated in one or both exams in Finance I. Female students were 47% of the participants.

All participants in this study knew about the purpose, procedures, and potential risks involved prior to providing their written consent. Participation was voluntary, and individuals were free to withdraw at any time. This research abided by all relevant ethical guidelines and was accepted by the institutional ethics review board. Data were anonymized to protect participants' privacy and confidentiality.

When examining the difference between the experimental and control groups before the intervention, no significant difference in grades was found between the groups. It can be assumed that random assignment between the groups was successful, and they were, on average, equivalent before the intervention. As shown in Figure 1, there was no difference between the control group (M = 7.29, SD = 1.76) and the experimental group (M = 7.60, SD = 1.48) ($t(104) = -1.01$, $p > 0.05$, $d = -0.20$).

Figure 1

Grade for Control Group and Experimental Group in Exam 1



After students were assigned to control and experimental groups, they received instructions according to their respective group. Each student received an email detailing where to attend their lectures and a reminder to bring identification. Research assistants, with lists for both control and experimental groups, ensured that students only attended their designated lectures. Although the instructional methods varied between lectures, they were not held at the same time and were therefore taught by the same professor, eliminating instructor quality as a potential source of bias. The experimental group received instruction using the TPS method, while the control group received traditional lectures. Since it was not feasible to teach the groups differently throughout the entire semester, only the last class session before the exam was used. In

this session, students participated in review sessions using the two teaching methods, depending on whether they were in the experimental or control group.

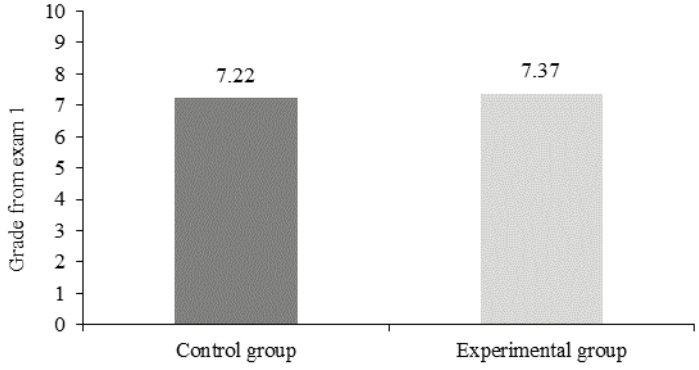
Results

To test the hypotheses, we employed both a between-participants design (experimental and control groups) and a within-participants design (first and second exams for each group). In addition, we examined whether gender differences influenced the results. For the between-participants design, independent samples t-tests were conducted, while paired-samples t-tests were used for the within-participants design. Given the experimental nature of our data, regression analysis was not necessary, as any confounding variables were accounted for through the randomization procedure.

When comparing the experimental and control groups post-intervention, it was revealed that there was no significant difference in students' grades between the experimental group (M = 7.37, SD = 2.12) and the control group (M = 7.22, SD = 2.09) ($t(108) = -1.01$, $p > 0.05$, $d = -0.07$). As seen in Figure 2, the difference was not significant, although it was in the expected direction.

Figure 2

Grade for Control Group and Experimental Group After Intervention

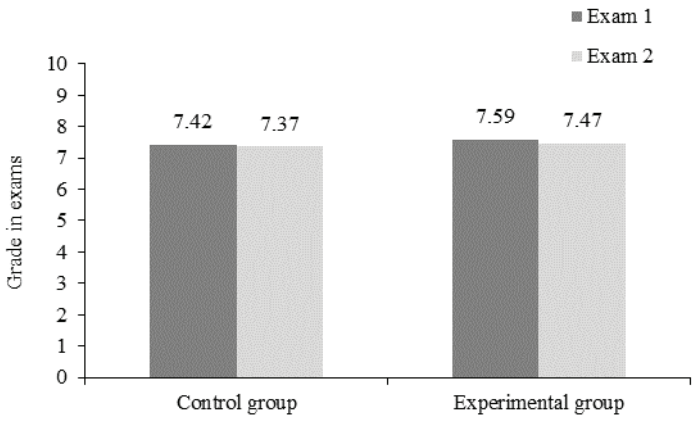


Another way to examine the potential effectiveness of instruction with TPS is to utilize within-participant design. With this method, the assumption is made that students are similar to themselves in the first and second exams. When the groups were compared to themselves in exams 1 and 2, it was revealed that there was no significant difference in students who received instruction with TPS in exam 1 (pre-intervention; M = 7.59, SD = 1.49) and exam 2 (post-intervention; M = 7.47, SD = 2.11) ($t(55) = 0.41$, $p > 0.05$, $d = 0.06$). Similarly, the same applies to those students who received traditional

instruction before exam 1 ($M = 7.42$, $SD = 1.67$) and exam 2 ($M = 7.37$, $SD = 2.01$) ($t(45) = 0.16$, $p > 0.05$, $d = 0.02$). As seen in Figure 3, the difference was almost nonexistent, indicating again that instruction with TPS had no significant impact on grades.

Figure 3

Grade of Control Group and Experimental Group Before and After Intervention (Within-Group Comparison)



In addition, we examined whether there was a gender difference in the effectiveness of TPS instruction. For both males and females, it was found that there was no significant difference in the grades of those who received TPS instruction compared to those who received traditional instruction. When only males were considered, there was no significant difference in the grades of students who received instruction with TPS ($M = 7.22$, $SD = 2.06$) and those who received traditional instruction ($M = 7.22$, $SD = 2.10$) ($t(56) = -0.01$, $p > 0.05$, $d = -0.00$). The same result was found for females, where there was also no significant difference in the grades of students who received instruction with TPS ($M = 7.56$, $SD = 2.22$) and those who received traditional instruction ($M = 7.23$, $SD = 2.11$) ($t(50) = -0.54$, $p > 0.05$, $d = -0.15$). However, it is worth noting that the grades for females were very close to being significantly higher for those who received TPS instruction. It may be possible to explore whether females are generally more receptive to TPS instruction with a larger sample size.

Discussion and Conclusions

This study aimed to compare the effectiveness of two different teaching methods – traditional lecture-based instruction and active learning through the Think-Pair-Share (TPS) method – on students' academic performance in an introductory finance course.

Despite the growing body of research suggesting the potential benefits of active learning (Bonwell & Eison, 1991; Freeman et al., 2007), our findings reveal no significant difference in learning outcomes between students who participated in traditional lectures and those who engaged in TPS-based active learning.

The results are particularly notable given that active learning, such as the TPS method, is believed to enhance student engagement and retention of material (Crouch & Mazur, 2001). However, in this randomized controlled trial, both groups – those receiving traditional and active learning – performed similarly on their exams, with no marked improvements for the experimental group. This finding is consistent with previous research that found mixed or negligible effects of active learning on learning outcomes in certain contexts (e.g., Freeman et al., 2014; Abdiodun et al., 2022). Moreover, the study found no differences between male and female students in the effectiveness of either instructional method, suggesting that the lack of impact of TPS on learning outcomes was not influenced by gender.

Our results suggest that although active learning is often advocated for its potential to increase academic achievement, its impact may not always be as anticipated, particularly in environments where content coverage is a key factor. The fact that the group receiving traditional lectures covered more material in the same amount of time is therefore a confounding variable worth noting when evaluating the advantages of TPS. This result aligns with research indicating that time constraints in active learning settings may limit content delivery (Cooperstein & Kocevar-Weidinger, 2004).

Our study was conducted in a controlled environment,and this approach fundamentally differs from research in other teaching contexts in both scope and length of intervention. Therefore, generalizing to other contexts such as different cultures, student groups, or teaching material is not warranted without further research. Nevertheless, it is reasonable to assume that other teaching contexts could underscore the challenges we observed, where factors such as class size, teachers' expertise, and available resources come into play. For instance, the emphasis on active learning on student participation and interaction may not hold in larger classes or where resources to implement effective activities are limited. Our results therefore suggest that the use of active teaching might require a more nuanced approach, with teachers being mindful that other teaching methods might prove to be more effective in some educational settings (Freeman et al., 2014).

Despite its limitations, this research provides noteworthy insights into the effectiveness of TPS for academic achievement. By emphasizing that in some cases active learning may not outperform traditional teaching methods, our study encourages teachers to take a more critical view of their own particular resource constraints when adopting new teaching methods for their classes.

Aknowledgment

The authors affirm that this research was conducted in accordance with the ethical standards of University of Iceland. All participants provided informed consent prior to their inclusion in the study. The authors have ensured the confidentiality of participants' data and adhered to all relevant guidelines regarding human or animal research. This research received no external funding, and the authors declare no conflict of interest.

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Tradiciniai ar aktyvūs finansinio švietimo mokymosi metodai? Atsitiktinių imčių kontroliuojamasis tyrimas

Sigurdur Gudjonsson[1], Kari Kristinsson[2]

[1] Islandijos universitetas, Verslo mokykla, Semundargata g. 10-102, Reikjavikas, Islandija, siggig@hi.is
[2] Islandijos universitetas, Verslo mokykla, Semundargata g. 10-102, Reikjavikas, Islandija, karik@hi.is

Santrauka

Finansinis raštingumas laikomas svarbiu asmeninės ir visuomenės gerovės komponentu. Šio tyrimo tikslas – palyginti studentų mokymosi rezultatus, taikant du skirtingus mokymo metodus aklo eksperimento sąlygomis: mokymąsi tradicinėse paskaitose ir aktyvų mokymąsi. Buvo lyginama 40 minučių trukmės tradicinė paskaita ir 40 minučių trukmės aktyvaus mokymosi sesija. Egzaminų metu buvo vertinami studentų mokymosi rezultatai. Taikant aklą metodą ir atsitiktinai paskirsčius studentus į grupes, buvo lyginamos didelės įvadinio finansų kurso studentų grupės (N = 48 ir N = 62). Tyrimas rodo, kad mokymosi rezultatai studentų, kurie mokėsi aktyvaus mokymosi būdu, ir studentų, kurie mokėsi tradiciniu būdu,

nesiskiria. Tyrimo rezultatai taip pat rodo, kad daugiau mokymosi medžiagos įsisavino studentų grupė tradicinėje paskaitoje. Darytina išvada, kad kai kuriais atvejais aktyvus mokymasis nėra geresnis už tradicinius mokymo metodus, todėl skatiname mokytojus kritiškiau žiūrėti į konkrečius išteklių apribojimus, taikant aktyvius mokymo metodus.

Esminiai žodžiai: *atsitiktinių imčių kontroliuojamasis tyrimas, aktyvus mokymasis, Think Pair Share metodas.*

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