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The Impact of Grade Difference on Competitive and Collaborative Engagement in Language Learning: A Quizizz-Based Survey

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Abstract

This study investigates how grade differences influence competitive and collaborative language learning engagement among first-year undergraduate students using an AI-powered LMS. By analysing data from 67 students over an academic year, we identified a threshold of 1.5 (95% CI: 1.3–1.7) grade difference. Groups with grade differences lower than this threshold tended to engage more in competitive learning, while those with larger differences favoured collaborative learning. Using a mixed-methods approach, we combined quantitative data analysis with qualitative survey responses to uncover the underlying reasons for these behaviours. Initially, students were randomly assigned to groups, and their interactions were observed throughout the first semester. At the end of the semester, students reorganised into self-selected groups, allowing us to monitor changes in engagement dynamics. The qualitative survey provided insights into students' motivations, revealing that competitive learning was driven by personal challenge and immediate feedback, whereas collaborative learning was valued for mutual support and knowledge sharing. These findings offer practical strategies for educators to optimise learning environments based on student group compositions, suggesting that similar-grade groupings can stimulate competition, while diverse groups enhance collaboration. Our study underscores the importance of understanding group dynamics and provides a framework for designing effective educational strategies tailored to different learning preferences and needs. *(примљено: 13. фебруара 2025; прихваћено: 6. маја 2025)*

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1. Introduction

Learning Management Systems (LMS) have become essential tools for enhancing teaching and learning experiences by providing structured environments for content delivery, student engagement, and performance assessment. Since their introduction in the late 20th century, LMS platforms have significantly transformed education, increasing accessibility and flexibility. Early platforms, such as Blackboard and Moodle, laid the foundation by digitising traditional classroom activities, enabling educators to manage course materials, track student progress, and facilitate communication within a centralised online space. The adoption of LMS has democratised education, allowing students to access learning materials anytime and anywhere. Moreover, LMS platforms support personalised learning by enabling educators to tailor content to individual student needs and learning paces, a shift that has been linked to improved engagement and academic performance.

As LMS technology has evolved, the integration of interactive and gamified elements has become more prevalent. These enhancements aim to increase student motivation by making learning more engaging and interactive. Among these platforms, Quizizz has emerged as one of the leading examples, offering a blend of traditional LMS functionalities with gamified quizzes and real-time feedback mechanisms. Launched in 2015, Quizizz provides educators with tools to create and share quizzes, conduct live multiplayer sessions, and assign asynchronous learning tasks. The platform's team mode facilitates collaborative learning, while competitive features, such as leaderboards and instant feedback, encourage student engagement through friendly competition. These functionalities align with broader trends in educational technology that prioritise interactivity and student-centred learning.

Despite its widespread adoption, the impact of Quizizz on learning behaviours, particularly in relation to competitive and collaborative learning dynamics, remains underexplored. While competition can drive motivation and performance, collaboration fosters knowledge sharing and peer support. This study investigates how grade differences within student groups influence their engagement in competitive versus collaborative learning activities on Quizizz. Specifically, we analysed data from student interactions on the platform to determine whether smaller grade disparities encourage competition and whether larger grade gaps foster collaboration. The findings from this study will provide educators with actionable insights to optimise group compositions and learning strategies, contributing to the ongoing evolution of LMS platforms and their role in enhancing educational experiences.

2. Literature Review and the Relevant Theories

Recent research continues to support classic theories that distinguish collaborative versus competitive learning dynamics. Social Interdependence Theory, originally developed by Deutsch (1949) and advanced by Johnson and Johnson (1989), provides a foundational framework. It posits that the way goals are

structured (cooperatively or competitively) determines how learners interact and, consequently, the outcomes of learning (Johnson/Johnson, 1999). In a cooperative goal structure, students perceive that they can achieve their goals only if their peers also do – this positive interdependence promotes help-giving, sharing, and teamwork. By contrast, a competitive (or negative interdependence) structure means one student's success comes at the expense of others, often leading to rivalry and reduced willingness to support classmates (Johnson/Johnson, 1999; Roseth et al., 2008). Empirical evidence accumulated over decades shows that cooperative settings tend to yield better academic achievement and peer relationships than competitive or individualistic settings (Slavin, 1983; Roseth et al., 2008). Johnson and Johnson (1999) found that students working cooperatively achieved higher performance, showed more critical thinking, and developed more positive peer relationships and self-esteem than those in strictly competitive or individualistic environments. These benefits are attributed to supportive interactions – students explain concepts to one another, resolve misunderstandings, and encourage effort, which enriches learning for all group members (Webb, 1989). By learning "together rather than alone," students not only master content but also practice teamwork skills in line with Social Interdependence Theory's predictions (Johnson/Johnson, 1999; Yang, 2023).

Underlying the success of collaborative learning are well-established constructivist theories. Piaget's theory of cognitive development emphasises that peer interaction can spur cognitive growth through socio-cognitive conflict – encountering a classmate's different viewpoint can productively challenge a learner's thinking and prompt deeper understanding (Piaget, 1932). Unlike adult-child interaction, peer collaboration places students on a more equal footing, allowing them to negotiate meanings and resolve disagreements, which Piaget saw as essential for the development of logic and morality (Piaget, 1932). Vygotsky's theory adds that social interaction is the engine of development, operating through the Zone of Proximal Development (ZPD). In collaborative settings, a more capable peer can help a less advanced student perform tasks they could not do alone, thereby stretching the learner's skills into the ZPD (Vygotsky, 1978). This scaffolding process is highly relevant in mixed-ability or mixed-grade groups: the "grade difference" between students can become an asset when older or more knowledgeable students guide others, accelerating the learning of the younger or less experienced peers (Vygotsky, 1978; Namaziandost et al., 2020). Thus, both Piagetian and Vygotskian perspectives suggest that collaborative engagement provides cognitive and social benefits that individual work or competitive rivalry may lack. As Johnson and Johnson (1999) noted, modern cooperative learning approaches are explicitly rooted in these theories – Piaget's idea of conceptual conflict and Vygotsky's ZPD – leveraging peer interaction as a catalyst for learning. Collaborative learning environments encourage dialogue, explanation, and shared problem-solving, all of which align with social constructivist principles of knowledge co-construction.

Research by educational psychologists and practitioners since the 1970s has operationalised these theories into effective cooperative learning methods. Slavin

(1983) and Johnson and Johnson (1999) were among the pioneers who showed how structured group activities can harness the power of cooperation. Key elements include positive interdependence (a group reward or goal that students strive for together) and individual accountability (each student is responsible for a portion of the task or for contributing to the group), which ensure that every member is engaged and learning (Slavin, 1983). Using such structures, students in cooperative teams have outperformed those in traditional classrooms on a range of outcomes, from test scores to problem-solving ability (Slavin, 1983; Slavin, 2015). For example, Slavin's Student Teams-Achievement Divisions and Johnsons' Learning Together techniques demonstrate that when students sink or swim together, they are more motivated to help one another understand the material. In contrast, purely competitive learning – where students work against each other for grades or rewards – can increase effort for some high-achievers but often leaves average and lower-performing students discouraged or disengaged (Johnson/Johnson, 1989). Excessive competition in the classroom has been linked to higher anxiety and less help-seeking, as students may fear that asking questions will make them appear "weak" in front of peers. Moreover, a climate of competition tends to undermine the trust and openness that facilitate peer learning, according to social interdependence theorists (Johnson/Johnson, 1989). That said, competition is not entirely detrimental – when used in moderation or in certain formats, it can boost motivation and participation. Notably, some cooperative learning models cleverly integrate competition in a healthy way. Teams-Games-Tournaments, for instance, pits teams against each other in academic tournaments; students cooperate within their team to prepare, then engage in a friendly competition across teams (Slavin, 1995). This hybrid approach leverages the excitement of competition to drive team cohesion and studying, showing that the boundary between collaborative and competitive learning can be productively blurred. Cavaletto and Miglietta (2024) argue that neither collaboration nor competition is inherently superior; what matters is how instructors structure and balance these elements. A supportive team competition can generate enthusiasm and effort, while still ensuring students share knowledge and strategies with their teammates (Slavin, 1995). This insight is especially relevant in game-based learning platforms and quizzes, where leaderboards (a competitive element) can be combined with team modes or peer help lifelines (collaborative elements) to maximise engagement.

In recent years, scholars have revisited collaborative vs. competitive learning through contemporary lenses, often confirming earlier findings while extending them to new contexts. Technology-enhanced learning has provided novel environments to examine these dynamics. For example, gamified language learning studies show that both competition and collaboration can be harnessed to engage students. Dindar et al. (2021) conducted an experiment with English vocabulary learning and found that both gamified cooperation and gamified competition led to significant vocabulary gains and high student motivation. Interestingly, students who learned collaboratively (by working in teams to earn points) and those who competed

individually against peers showed similar levels of task effort and achievement in the short term (Dindar et al., 2021). However, the researchers noted differences in social outcomes: cooperative groups reported greater peer support and enjoyment, whereas competitive learners were driven more by rank and rewards (Dindar et al., 2021). In line with the ethos of social interdependence theory, Dindar et al. ultimately recommend prioritising collaborative elements in educational game design to foster sustainable engagement and social interaction, rather than an overreliance on competition. This reflects a broader trend in recent literature emphasising the value of collaboration for deeper learning and student well-being. For instance, a European education project focusing on peer learning found that cooperative learning not only improved participants' academic performance but also enhanced their social and emotional skills, such as teamwork, empathy, and communication (Cavaletto/Miglietta, 2024). These 21st-century skills are increasingly seen as critical outcomes of education, and collaborative methods are highlighted as a prime way to cultivate them (Cavaletto/Miglietta, 2024; Yang, 2023). At the same time, other new studies remind us that a balanced approach can be effective. Some students are naturally motivated by competition, and when the competitive spirit is channelled positively, it can increase their engagement without harming others. Recent meta-analyses have even revisited the classic debate: a meta-analysis by Chen et al. (2018) confirmed that computer-supported collaborative learning has numerous benefits across cognitive, skill-based, and affective outcomes, while also noting that a thoughtful incorporation of competitive challenges (like time-based quizzes or inter-team contests) can further stimulate participation for certain learners. The key is that competition should not pit students against their own teammates or create a zero-sum atmosphere (Yang, 2023). Instead, modern pedagogical designs often use cooperative competition – for example, language classes might be divided into groups that compete in a quiz game; within each group, students collaborate to make sure everyone understands the material, because the group's average performance decides the winner (Namaziandost et al., 2020). Such designs echo Vygotsky's idea of learners working together to reach a goal just beyond their current level, while adding a fun, gamified challenge to spur excitement.

3. Study Design

This study employed a mixed-methods design, combining quantitative and qualitative approaches to explore how grade differences influence competitive and collaborative learning engagements on an AI-powered LMS (Quizizz). The central premise of mixed-methods research – capturing both breadth (quantitative data) and depth (qualitative insights) – enabled a comprehensive understanding of students' motivational drivers, engagement patterns, and perceived benefits or challenges when working in groups of varying academic performance levels. A total of 67 first-year undergraduate students (29 male, 38 female), at the Faculty of Science and Mathematics, University of Montenegro, participated in this study. First-year undergraduates were selected because they often undergo substantial

academic and social transitions, making them an ideal population to examine group dynamics and learning preferences. All 67 students completed their first-semester activities, but 15 of them did not participate in the qualitative survey at the end of our study. This yielded 52 complete responses for the qualitative component.

The study took place over an entire academic year (approximately 10 months), divided into two semesters[1]. Two different group assignment strategies were employed to examine how group composition shapes competitive or collaborative tendencies. At the start of the academic year, students were randomly assigned into groups of 5–7 members using Microsoft Excel's "RAND" function. This randomisation ensured that any observed group differences during the first semester were not driven by self-selection or social familiarity. Random group assignments also provided baseline (control) data for competitive and collaborative engagement within groups of varying grade compositions. At the beginning of the second semester, students were allowed to reorganise themselves into self-chosen groups. This rearrangement enabled us to see whether and how students naturally cluster based on comfort, relationships, or perceived academic benefit, and whether self-selection alters competitive or collaborative behaviours.

Data collection spanned both semesters, enabling longitudinal observations of student engagement. Quizizz provides built-in analytics that record student participation frequencies, scores, and time spent on activities. Data points included:

1) Individual quiz scores: numeric scores from competitive quizzes.
2) Team scores / collaborations: performance metrics for team-mode quizzes.
3) Engagement metrics: frequency of participation in different quiz modes (competitive vs. collaborative), leaderboard viewing, and time spent per question.
4) Grade differences: official course grades or numeric point aggregates (e.g., test and assignment scores) were used to compute pairwise grade differences within each group.
5) Student survey: at the end of each semester, students were invited to complete a survey delivered via Google Forms.
    a) Close-ended items explored students' self-reported engagement frequency in competitive vs. collaborative tasks, their motivations (e.g., challenge, immediate feedback, peer support), and their perceptions of effectiveness. Close-ended questions used Likert-type scales (e.g., 1 = Never, 5 = Always; 1 = Strongly Disagree, 5 = Strongly Agree) to quantify motivational drivers and perceived effectiveness,
    b) Open-ended items asked students to describe specific experiences where competitive or collaborative learning had helped them understand course material better. This free-text feedback provided depth to the numerical trends.

1 Courses in question: General English Language 1 & 2.

All quantitative data (quiz scores, engagement metrics, group compositions, grade differences) were exported from Quizizz into the CSV format and then imported into Thonny (a Python IDE) for analysis using Pandas, NumPy, and SciPy libraries. Instances of incomplete Quizizz records (e.g., due to technical issues) were flagged. If a participant's data were missing in a minor number of activities, imputation (mean substitution) was used; if data were extensively missing, the participant was excluded from specific analyses. Extreme scores (±3 SD from the mean) were examined to determine if they resulted from data-entry error or unusual performance. Legitimate outliers were retained to capture the full range of engagement.

Mean, median, standard deviation, and range were computed to summarise competitive and collaborative engagement scores. Group-level grade differences were calculated and used to categorise groups as having smaller (< 1.5 difference) or larger (≥ 1.5 difference) grade disparities. Independent samples t-tests were conducted to compare the mean competitive and collaborative engagement scores between groups with smaller vs. larger grade differences. Effect size (Cohen's d) was calculated to determine the practical significance of observed differences. Statistical significance was set at $p < 0.05$ for all tests; effect sizes were interpreted following conventional thresholds (small, medium, large).

Qualitative data were analysed using thematic analysis to contextualise the quantitative results. All open-ended survey responses were read multiple times by two researchers to gain an initial sense of common themes. Responses were imported into a Pandas DataFrame for systematic review. Each researcher independently labelled key phrases related to competitive or collaborative learning motivations, benefits, and challenges. The two researchers compared initial codes and discussed discrepancies to arrive at a consensus. Cohen's kappa was computed on a subset of responses to quantify agreement in coding (> 0.80 indicated high reliability). Codes were grouped into broader themes (e.g., "Motivation Through Challenge," "Immediate Feedback," "Mutual Support," "Knowledge Sharing"). Themes underwent iterative refinement to ensure they accurately reflected participant narratives. Emergent themes were compared against quantitative findings (e.g., frequency of competitive vs. collaborative engagement) to develop a cohesive interpretation of how grade differences shape learning behaviours on the platform.

Prior to data collection, students were informed of the study's purpose, procedures, and voluntary nature of participation. Signed consent was obtained from all participants, ensuring they understood that their data would be used anonymously for research and course improvement purposes. All student identifiers were removed from the dataset. Each student was assigned a random ID code, and only aggregate data are reported in this publication. Surveys were submitted anonymously.

4. Quantitative Results

An analysis of the impact of grade differences on competitive and collaborative learning engagement among students using Quizizz revealed clear patterns in

how learners interact under varying academic compositions. Descriptive statistics showed that smaller grade gaps – specifically those below the threshold of 1.5 (95% CI: 1.3–1.7) – were closely linked to higher competitive engagement. In these more academically homogeneous groups, the mean competitive engagement score was 3.5 (SD = 0.8), while the mean collaborative engagement was 2.3 (SD = 0.7). Conversely, larger grade gaps – those at or above 1.5 (95% CI: 1.3–1.7) – correlated with a marked shift towards collaborative learning. Here, the mean collaborative engagement score rose to 3.8 (SD = 0.9), and the mean competitive score dropped to 2.1 (SD = 0.6). This divergence emphasised a strong inverse relationship between grade differences and the dominant form of engagement.

Importantly, the 1.5-point mark in grade disparities emerged as a natural inflection point, serving as a meaningful boundary rather than a random cutoff. In essence, when students perceive their peers as being at a similar academic level, they more readily engage in score comparisons, leaderboards, and discussions aimed at outperforming one another. On the other hand, when they recognise a significant variation in expertise within the group, they shift to strategies such as shared problem-solving and peer-assisted learning, as predicted by Vygotsky's concept of the Zone of Proximal Development.

To confirm that these distinctions in engagement patterns were not merely incidental, independent t-tests were conducted for both competitive and collaborative scores. For competitive engagement, the t-statistic (7.89, df = 65, $p < 0.001$) showed a highly significant difference between groups with smaller and larger grade gaps. A similar result was observed for collaborative engagement (t-statistic = -8.45, df = 65, $p < 0.001$), reinforcing the conclusion that grade differences play a decisive role in shaping whether students compete or collaborate.

Beyond statistical significance, effect size calculations underscored the practical importance of the findings. Cohen's d values were 0.88 for competitive engagement and 0.96 for collaborative engagement – both considered very large effects – indicating that the divergence in student behaviours is not only statistically reliable but also highly meaningful in real-world settings. A post-hoc power analysis further confirmed that the study was sufficiently powered to detect these differences (0.81 for competitive engagement and 0.87 for collaborative engagement), reducing the likelihood of overlooking a true effect due to sample-size limitations.

Taken together, these results underscore the critical role that grade differences play in determining how students engage with one another on Quizizz. Smaller gaps encourage competition by providing a level playing field where students naturally compare performances and strive for top ranks. Larger gaps, in contrast, encourage students to leverage each other's varied knowledge and skill sets, resulting in more frequent discussions, cooperative problem-solving, and mutual support, where interactions with more knowledgeable peers facilitate deeper understanding and skill mastery.

From an applied perspective, the study's findings offer straightforward yet powerful guidance for both educators and instructional platform developers.

When designing learning activities with a competitive edge – such as quizzes and challenges that rely on fast performance and leaderboard rankings – grouping students of similar academic standing can capitalise on their competitive energy and may boost motivation or performance outcomes. Meanwhile, if the goal is to foster collaboration and collective knowledge-building, intentionally creating groups with broader grade disparities can cultivate an environment that encourages peer tutoring, scaffolding, and constructive dialogue. By recognising the 1.5 (95% CI: 1.3–1.7) threshold as a practical benchmark, instructors can more deliberately tailor group compositions to match their pedagogical objectives and students' natural inclinations.

Although these results already illuminate significant aspects of learning behaviour, they also invite further inquiry into potential variations across different subjects or educational levels. Future studies might investigate whether the same threshold persists in advanced courses, or how the nature of the subject matter – e.g., quantitative versus qualitative disciplines – modulates the interplay between competitive and collaborative dynamics. Nonetheless, our work provides a strong initial framework for understanding how grade gaps shape learning interactions in technology-rich environments, highlighting a potent lever for instructional design and classroom management.

5. Qualitative Analysis

To complement the statistical findings, a qualitative analysis was conducted to uncover the underlying motivations, perceptions, and experiences influencing students' learning behaviours on the Quizizz platform. Using a systematic thematic analysis of open-ended survey responses, this approach offered a richer perspective on how and why certain grade differences lead to competitive versus collaborative engagement patterns. Data were collected from 52 students (out of 67 total participants), with 15 students not responding for various reasons. The analysis followed a structured process that began with repeated reading of all responses to gain familiarity with the overall content. The qualitative data were then organised in a Pandas DataFrame within the Thonny IDE, enabling efficient filtering and preliminary categorisation. In the initial coding phase, researchers identified and labelled key words or phrases in each response, grouping similar ideas to lay the groundwork for theme development. These codes were later clustered into broader themes, which underwent several rounds of refinement to ensure accuracy. Finally, each theme was defined and supported by illustrative student quotes, providing concrete examples of the experiences and motivations behind competitive or collaborative learning.

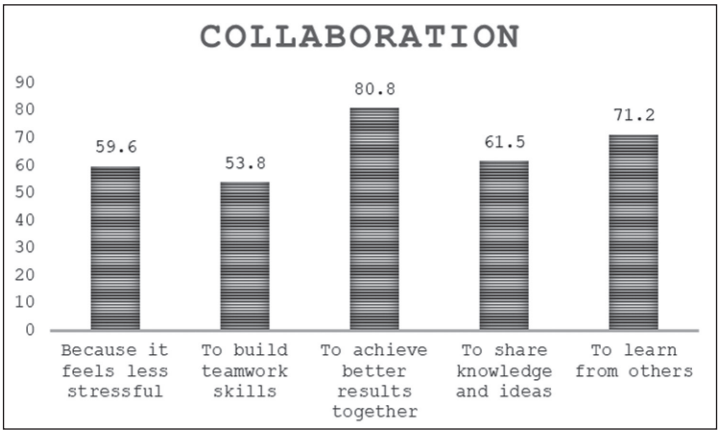

Chart 1. Motivations for collaborative learning activities

Chart 1 illustrates five key motivations students have for engaging in collaborative learning activities, ranked according to the percentage of respondents who agreed with each statement. The most cited motive, at 80.8 percent, is the desire to achieve better results by working together. Next, at 71.2 percent, comes the opportunity to learn from others, reflecting a strong emphasis on the value of peer-to-peer exchange and expertise. A little over 61 percent of participants highlight the benefit of sharing knowledge and ideas within a group context. Just under 60 percent of students report that collaborating feels less stressful, suggesting that group work can help alleviate individual pressure. Finally, slightly more than half of respondents (53.8 percent) indicate that they engage in collaborative activities to build teamwork skills, emphasising how working with peers prepares them for cooperative projects in both academic and professional settings. These findings suggest that students see collaboration not only as a way to produce higher-quality work but also as an environment that fosters mutual support, idea-sharing, and skill development.

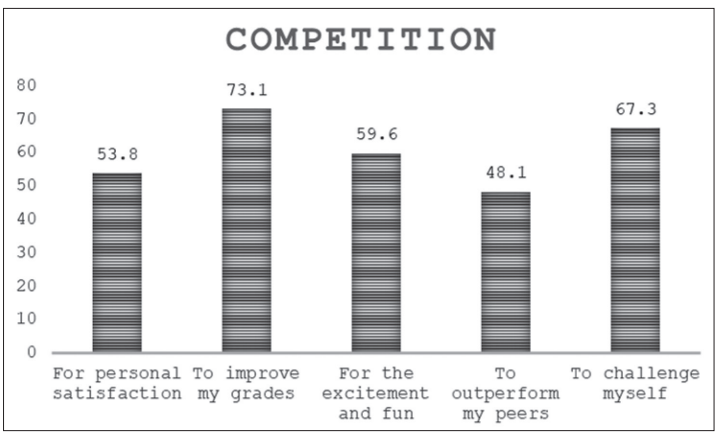

Chart 2. Motivations for competitive learning activities

Chart 2 presents five main reasons why students engage in competitive learning, according to the percentage of respondents. The leading motivation—cited by 73.1 percent—is the desire to improve grades, highlighting students' focus on concrete academic outcomes. Next, at 67.3 percent, is the drive to challenge oneself, suggesting that many learners see competition as a way to push personal boundaries. Around 60 percent of respondents mention excitement and fun as a key factor, indicating that competition can also provide an element of enjoyment. Over half of students, at 53.8 percent, pursue competitive learning for personal satisfaction, emphasising the internal rewards gained from meeting and exceeding goals. Finally, 48.1 percent aim to outperform their peers, reflecting that, while competitive spirit does play a role, it is somewhat less important than the desire for self-improvement and good grades.

These open-ended responses offered deeper insight into why students chose one mode of engagement over the other. Those who valued competitive learning often cited a heightened sense of motivation when challenged by peers of similar ability, finding that striving to surpass others kept them focused and drove them to study more thoroughly. They also noted the thrill of immediate feedback, as real-time leaderboards and scoring mechanisms helped them track their progress and adjust strategies accordingly. By contrast, students who favoured collaborative learning consistently mentioned mutual support and the shared pooling of knowledge. This reduced stress and a strong sense of camaraderie emerged when working with peers who brought different strengths to the table, allowing group members to tackle complex topics collectively. Multiple respondents stressed that open discussion and debate were not only less anxiety-inducing but also led to a deeper understanding of the material.

From an instructional standpoint, these qualitative themes offer practical ways to shape group-based learning. If an instructor wishes to harness the motivational power of competition, forming groups of students with relatively similar grades may intensify engagement and drive performance. On the other hand, assembling academically diverse teams can spur collaboration, enabling students to fill in one another's knowledge gaps and develop important teamwork skills. Recognising these distinct preferences and experiences allows educators to align group activities with course objectives, choosing either a competitive or collaborative approach depending on whether the goal is to spark individual challenge or to foster collective problem-solving.

6. Discussion

The findings from this study strongly support the hypothesis that grade differences significantly impact learning engagement on the Quizizz platform. Smaller grade disparities foster a competitive learning environment, likely due to students having similar cognitive levels and a natural tendency to compare performances. This competitive behaviour is evident in our data, with 50% of students often or always engaging in competitive learning when grade differences are less

than 1.5 (95% CI: 1.3–1.7), and 73.1% citing grade improvement as a key motivator. Social Interdependence Theory provides a useful framework for understanding this phenomenon. According to this theory, negative interdependence occurs when students perceive their academic success as relative to their peers. In environments with minimal grade differences, students are more likely to engage competitively, striving to outperform their peers to enhance their own academic standing. This heightened competition serves as a strong motivational driver, pushing students to engage more deeply with the material. Larger grade disparities encourage collaborative learning, as students with varying levels of expertise benefit from working together and leveraging each other's strengths. The data supports this trend, with 53.8% of students often or always engaging in collaborative learning when grade differences exceed 1.5 (95% CI: 1.3–1.7), and 80.8% believing that collaboration leads to better results. This aligns with Vygotsky's Zone of Proximal Development (ZPD), which suggests that students learn best when working alongside more knowledgeable peers who provide scaffolding and guidance. Larger grade differences create opportunities for peer-supported learning, allowing students with higher proficiency to assist those who need additional support, thus fostering an effective collaborative learning environment. The qualitative feedback reinforces these quantitative findings, with many students reporting that diverse group compositions helped them grasp difficult concepts more effectively through mutual support and shared knowledge.

These findings are further substantiated by Johnson, Johnson, and Holubec's (1994) research on cooperative learning, which demonstrates that students engaged in collaborative learning outperform those in competitive or individualistic settings across various academic and social measures. Their meta-analysis highlights that collaborative learning enhances academic achievement, interpersonal skills, and psychological well-being, reinforcing the positive impact of grade-diverse groupings on learning outcomes. The insights gained from this study have significant implications for educators and platform developers. Educators can optimise learning strategies by considering group compositions that align with learning objectives. Grouping students with similar grades can stimulate competition, driving motivation and enhancing individual achievement. This aligns with Slavin's (1983) research, which found that structured competitive activities can enhance student performance when designed effectively. In contrast, diverse groupings can enhance collaborative experiences, fostering deeper understanding, teamwork, and collective critical thinking skills. Webb (1989) found that academically heterogeneous groups with students of varying abilities tend to perform better than homogeneous groups, further supporting the idea that larger grade differences encourage collaborative learning by leveraging different strengths and perspectives. Similarly, Lou, Abrami, and d'Apollonia's (2001) meta-analysis confirms that mixed-ability groups promote higher achievement and more positive attitudes towards learning compared to uniform-ability groups.

The effectiveness of both competitive and collaborative learning is further highlighted by student perceptions, with 53.8% of students rating competitive

learning as highly effective and 55.8% rating collaborative learning as highly effective. This suggests that neither learning mode is inherently superior, but rather that their effectiveness is context-dependent, varying based on factors such as subject matter, student preferences, and group composition. Educators should carefully consider the learning context when designing group-based activities to maximise engagement and academic outcomes.

This study also highlights the role of digital learning platforms like Quizizz in shaping learning dynamics. Research by Dillenbourg (1999) emphasises the importance of technology in facilitating collaboration, and Quizizz's real-time feedback, gamification, and interactive features effectively support both competitive and collaborative learning modes. Vali (2023) demonstrated how technology-mediated collaborative environments significantly improve student engagement and knowledge retention, reinforcing the potential of digital platforms to enhance learning outcomes when used strategically.

Our study underscores the critical role of grade differences in shaping learning behaviours in technology-enhanced education. By understanding these effects, educators can design more effective learning experiences that capitalise on the strengths of both competitive and collaborative engagement. Future research should explore additional factors influencing learning behaviours, such as individual learning styles, subject-specific engagement patterns, and social-emotional learning (SEL) competencies. Further investigation into SEL in collaborative settings, as highlighted by Knapp (2019), could provide additional insights into how social skills influence learning dynamics in mixed-ability groups. Expanding this research to other digital learning platforms and different educational contexts will help refine these strategies, ensuring that educators can optimise learning environments for diverse student populations.

7. Conclusion

This study investigated the impact of grade differences on learning engagement, specifically examining how competitive and collaborative learning behaviours manifest on the Quizizz platform. The findings strongly support the hypothesis that grade differences significantly shape learning dynamics, with smaller grade disparities fostering a competitive environment and larger disparities encouraging collaboration. These insights have practical implications for various stakeholders, including educators, students, and educational technology developers.

For educators, understanding the role of grade differences in shaping engagement can inform the design of more effective learning strategies. Grouping students with similar grades can stimulate competition, which enhances motivation and individual achievement. Diverse group compositions promote collaborative learning, fostering deeper understanding, teamwork, and critical thinking skills. By considering these dynamics, educators can tailor their teaching methods to suit the specific needs of their students, ultimately improving learning outcomes.

For students, recognising the conditions that favour competitive or collaborative learning can help them engage more effectively in their studies. By critically

examining and understanding their individual learning preferences, students can make deliberate and informed decisions about their approach to course materials and participation in classroom activities. For instance, a student who identifies a preference for competitive scenarios may actively seek opportunities to engage in individual assessments, quizzes, or contests, finding these activities stimulating and motivational. On the other hand, a student who recognises their affinity for collaborative situations might proactively participate in group discussions, team projects, or peer-based study groups, thus aligning their academic involvement with their preferred learning style. Such informed alignment between personal preferences and chosen activities can lead to higher motivation, deeper engagement, improved academic performance, and a more satisfying educational experience overall.

For platform developers, particularly those designing educational tools like Quizizz, these findings highlight opportunities to enhance adaptive learning features. By incorporating features that facilitate both competitive and collaborative learning, developers can create more versatile and personalised learning environments. Implementing adaptive grouping algorithms that consider grade differences could optimise student engagement, ensuring that learning experiences are aligned with students' natural tendencies towards competition or collaboration.

While this study provides valuable insights, it also has limitations that warrant consideration. The sample size was relatively small, consisting of 52 first-year undergraduate students, which may limit the generalisability of the findings. Additionally, the study was conducted over a single academic year, and longer-term effects of grade differences on learning engagement were not explored. Future research should seek to replicate this study with larger and more diverse samples, across different academic levels and disciplines, to validate and expand upon these findings.

Further exploration of other factors influencing learning behaviours, such as individual learning styles, socio-economic backgrounds, and technological proficiency, could provide a more comprehensive understanding of how to optimise educational strategies. Additionally, future studies could examine longitudinal effects to determine whether the impact of grade differences on learning engagement persists over time. By expanding on these areas, researchers can further refine strategies for improving learning experiences in both digital and traditional educational environments.

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Sažetak

UTICAJ RAZLIKA U OCJENAMA NA TAKMIČENJE I SARADNJU U UČENJU JEZIKA: ISTRAŽIVANJE ZASNOVANO NA PLATFORMI KVIZIZ

Istraživanje ispituje kako razlike u ocjenama utiču na učenje kroz takmičenje i saradnju kod studenata prve godine koji koriste platformu Kviziz. Analizom podataka 67 studenata tokom akademske godine, došli smo do praga od 1,5 sa intervalom pouzdanosti od 95 % za vrijednosti od 1,3 do 1,7. Grupe studenata čije su ocjene bile sa razlikama manjim od praga bile su sklonije međusobnom takmičenju, dok su grupe sa većim razlikama pokazale veću želju za saradnjom. Koristili smo mješoviti metodološki pristup, jer naše istraživanje kombinuje kvantitativnu analizu rezultata sa kvalitativnim podacima dobijenim iz anketa. Tokom prvog semestra, studenti su bili nasumično raspoređeni u grupe, dok su u drugom semestru studenti birali sopstvene grupe, što nam je omogućilo praćenje promjena u učenju. Rezultati su pokazali da je takmičenje motivisano izazovima nadmetanja sa drugima i neposrednim povratnim informacijama, dok je saradnja bila preferirani oblik učenja za neke studente zbog zajedničke podrške i razmjene znanja. Statistička analiza potvrdila je značajnu razliku u učenju u zavisnosti od raspodjele ocjena ($p < 0,001$). Dobijeni nalazi su u skladu sa socio-kognitivnim teorijama kao što su Zona narednog razvoja i Teorija društvene međuzavisnosti, koje naglašavaju značaj grupne dinamike u učenju. Praktične implikacije našeg istraživanja ukazuju na to da nastavnici mogu da optimizuju učenje na sljedeći način: akademski homogene grupe obično podstiču takmičenje, dok akademski heterogene grupe preferiraju saradnju. Ponuđeno istraživanje doprinosi razumijevanju digitalnih alata i nastave, pružajući smjernice za efikasniju organizaciju nastave.

Ključne riječi:

razlike u ocjenama, takmičenje i saradnja, digitalne obrazovne platforme, angažovanost studenata, Kviziz

Appendix

Survey Questionnaire: Understanding Reasons for Collaborative and Competitive Learning

Close-Ended Questions

1. How often do you prefer engaging in competitive learning activities (e.g., quizzes, games) on Quizizz?
   a) Never b) Rarely c) Sometimes d) Often e) Always
2. How often do you prefer engaging in collaborative learning activities (e.g., group discussions, joint problem-solving) on Quizizz?
   a) Never b) Rarely c) Sometimes d) Often e) Always
3. What motivates you to participate in competitive learning activities? (Select all that apply)
   a) To challenge myself b) To outperform my peers
   c) For the excitement and fun d) To improve my grades
   e) For personal satisfaction
4. What motivates you to participate in collaborative learning activities? (Select all that apply)
   a) To learn from others b) To share knowledge and ideas
   c) To achieve better results together d) To build teamwork skills
   e) Because it feels less stressful
5. How effective do you find competitive learning activities in helping you understand the material?
   a) Not effective at all b) Slightly effective c) Moderately effective
   d) Very effective e) Extremely effective
6. How effective do you find collaborative learning activities in helping you understand the material?
   a) Not effective at all b) Slightly effective c) Moderately effective
   d) Very effective e) Extremely effective
7. When you are in a group with a significant grade difference, do you find it easier to engage in collaborative learning?
   a) Strongly disagree b) Disagree c) Neutral
   d) Agree e) Strongly agree

Open-Ended Questions

1. Describe a specific experience where you felt competitive learning significantly helped you understand the material better. What aspects of that experience made it effective?
2. Describe a specific experience where you felt collaborative learning significantly helped you understand the material better. What aspects of that experience made it effective?