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A QUANTITATIVE ANALYSIS OF STUDENTS' PERCEPTIONS ON FACTORS AFFECTING TEACHING STRATEGIES IN MATHEMATICS CLASSROOM DISCUSSIONS

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ABSTRACT

This quantitative study examined how motivational practices and experiences, goal setting and accomplishments, and personalized learning relate to teaching strategies in mathematics classroom discussions among students at San Isidro College. Data were gathered via an adapted online questionnaire. Descriptive statistics summarized perceptions; independent-samples t-tests assessed sex differences; and Pearson correlations tested associations. Students reported high perceptions across all factors, indicating broad support for student-centered instruction. No significant sex differences emerged. Positive correlations among factors suggest nurturing motivation, co-creating clear goals, and offering personalized pathways reinforce one another to sustain discourse. The study concludes that integrating these elements can strengthen mathematics discussions. Limitations include single-institution context, self-report, and convenience sampling; future work should use stratified sampling, mixed methods, and predictive modeling.

Keyword: Motivational practices and experiences, Goal setting and accomplishments, Personalized learning, Mathematics classroom discussions, Mathematics teaching strategies

1. INTRODUCTION

Mathematics sits at the heart of schooling because it develops logical reasoning, problem-solving, and analytical habits that carry into daily life and work. It anchors learning in economics, science, technology, and engineering, and helps learners weigh evidence, choose among options, and tackle real problems (OECD, 2019). Yet many students still meet mathematics with worry rather than curiosity especially when abstract ideas are delivered mostly through lecture fueling anxiety, doubt, and disengagement (Irfan et al., 2023; Angraini & Prahmana, 2019).

Thoughtfully led class discussions can change that dynamic. When students talk through strategies, test ideas, and hear peers' reasoning, abstract concepts become negotiable and clear. Research consistently shows that student-centered approaches, problem-based and inquiry-based learning among them that raise achievement, strengthen problem-solving, and deepen engagement across levels (Macapayad, 2025; Ahmad et al., 2024; Shalsabilla Novarizka et al., 2024; Khasawneh et al., 2023). Still, much of the literature treats "teaching strategies" as a broad label and privileges teacher perspectives, leaving less attention to specific drivers' motivational practices and experiences, goal setting and accomplishments, and personalized learning or to how perceptions differ by student background (Darling-Hammond et al., 2020; Bautista & Valtoribio, 2024; Hofer et al., 2022; Gutierrez, 2021).

This study responds to that gap in the context of Mathematics in the Modern World at San Isidro College. It examines how motivational practices, goal setting, and personalization contribute to teaching strategies in mathematics discussions, and how student characteristics relate to these perceptions. This study focuses on three main questions. First, how much do students think each of the three factors contributes to the teaching strategies used in their mathematics classes? Second, are these views connected to their personal profiles, such as their background or characteristics? Third, how are these three factors related to one another? By understanding these connections, the study hopes to guide teacher education so that future mathematics teachers can design flexible, student-centered, and responsive

discussions that support deeper and more meaningful learning.

2. LITERATURE REVIEW

Students' Perception Teaching Strategies

Student perception is very important to be determined; this give teachers the knowledge needed to came up with the right strategy to be use during classes. According to Lazarides et al. (2022) mathematical motivational transitions are linked to student-perceived teaching behaviors, especially student-oriented teaching, which hinders maladaptive transitions. Using data from PISA and PISA Plus 2012–2013, the study used latent profile and transition analyses with a large sample of 2605 students from 198 classrooms. Söderström et al. (2024) perceived feedback usefulness is directly impacted by mastery goals; national test scores, self-efficacy, performance objectives, and intrinsic/extrinsic motivation have no effect; structural equation modeling was used for analysis. Additionally, Khasawneh et al. (2023) according to a quasi-experimental study involving 41 students, inquiry-based learning considerably raises math achievement in college algebra when compared to traditional lecture-based learning. In the local context, Macapayad (2025) A study with 232 participants using a descriptive correlational design found that problem-based learning significantly improves math problem-solving performance in Grade 9 students.

Motivational Practices and Experiences

Teachers should determine what make their students to be motivated, and throughout that they could gain experiences that will be a valiable data for the teacher. According to Söderström et al. (2024), students who got encouraging feedback improved their ability to reason and took an active part in class discussions. In a similar vein, Hossein-Mohand and Hossein-Mohand (2023) discovered that learners' perceptions of mathematics were strongly influenced by motivation, with motivated students displaying more favorable attitudes toward teaching methods. Wu et al. (2022) confirmed that mastery-oriented learners evaluated teaching strategies more favorably, while Lazarides et al. (2022) highlighted that students with stronger achievement goals perceived mathematics instruction as more effective. According to Alcober et al. (2025), elementary school pupils thought that student-centered approaches were interesting and inspiring. In a similar vein, Macapayad (2025) showed that problem-based learning improved the problem-solving skills and math discussion participation of Grade 9 students.

Goal Setting and Accomplishments

Students who are knoweldgeable with what they need to do and also the accomplishment they gain makes their performance in mathematics improved. Mutawah et al. (2017) found a significant relationship between math and science performance and goal orientation, self-efficacy, and task value in a large study. Setting goals is one of the best tactics in traditional, blended, and online learning environments, according to Xu et al.'s (2023) synthesis of global data on self-regulated learning. According to a recent study by ‘íčan et al. (2022), which used regression analysis and item-response theory with 1,133 participants, metacognitive monitoring is a significant predictor of mathematics achievement in fifth graders across different curricula. The effectiveness of goal-setting in virtual classrooms was also shown by Aviory et al. (2025), who confirmed that it significantly increased students' math achievement in online learning environments. According to Nermal et al. (2025), senior high school students' achievement motivation was significantly predicted by goal setting and self-efficacy, indicating that students with more specific goals were more motivated to succeed. Additionally, Cho & Heron (2015) provided evidence that goals mediate students' learning experiences by showing how achievement goals shaped emotions and tolerance for failure, which in turn influenced mathematics motivation.

Personalized Learning

Tailoring instruction to students' needs and contexts strengthens relatedness helping learners feel seen, supported, and willing to participate in mathematics discussions. Individualized online lesson sequences have been shown to deepen engagement and improve outcomes (Loriente et al., 2025); validated measures indicate that students report positive perceptions when classrooms are designed for personalization (Tuo et al., 2025); adaptive, learner-responsive approaches elevate motivation and enjoyment (Mötteli et al., 2023); and in blended settings, giving students control over pace and modality

enhances mathematical self-concept and perceptions of learning (Jasmin & Ongcoy, 2024).

2. Theoretical Framework

This study is anchored on Deci and Ryan's Self-Determination Theory (SDT) (1985) and Barry J. Zimmerman's Self-Regulated Learning (SRL) model (2000). Self-Determination Theory (Deci and Ryan, 1985) explains that learners thrive when three basic psychological needs are supported: autonomy, competence, and relatedness. In this study, these needs are reflected in students' perceptions of (a) motivational practices and experiences, (b) goal setting and accomplishments, and (c) personalized learning. Because need-supportive teaching is designed to benefit all learners, SDT provides a basis for testing whether perceptions differ by sex.

H1: There is no significant difference in students' perceptions of motivational practices and experiences, goal setting and accomplishments, and personalized learning when grouped according to sex.

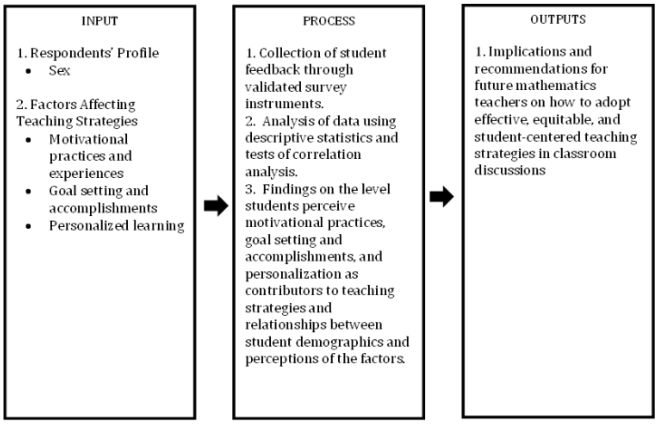
In a large secondary-school sample, preliminary tests showed no significant gender differences for intrinsic motivation, grade aspirations, or perceived competence key SDT-linked learner perceptions under autonomy-supportive teaching in English classes (t-tests ns) (Muth & Marko Lüftenegger, 2024). Similarly, a study of students' preferences for autonomy-supportive teaching reported no gender differences on the overall LASPI score across educational levels (Studenska, 2019). Within the Input–Process–Output (IPO) model, sex and the three perception variables enter as inputs; the process involves administering validated measures and performing difference tests; the outputs are evidence-based recommendations for equitable, autonomy-supportive discussion strategies in Mathematics in the Modern World.

The Self-Regulated Learning model (Zimmerman, 2000) describes engagement as a cycle with three phases: forethought (setting goals and planning), performance (strategy use and monitoring), and self-reflection (evaluation and adaptive regulation). In this study, motivational practices and experiences provide the value and efficacy cues that launch forethought; goal setting and accomplishments operationalize goal clarity and self-evaluation; and personalized learning captures strategic choice, feedback use, and monitoring during performance. SRL therefore predicts that these three perceptions should move together in productive classrooms.

H2: There is a significant positive relationship among students' perceptions of motivational practices and experiences, goal setting and accomplishments, and personalized learning.

Accordint to study of (Guntur & Purnomo, 2024) a recent meta-analysis in the *Online Learning Journal* reported an overall moderate positive effect of SRL interventions on learning outcomes (random-effects model ≈ 0.65), with benefits observed across course types, school levels, and learning settings. The review emphasizes that strengthening goal setting, time management, and metacognitive monitoring helps students leverage feedback and personalize their study strategies direct support for positive linkages among your three constructs. In the IPO model, these perceptions function as inputs that activate SRL processes during instruction; the process phase captures strategy enactment and monitoring in Mathematics in the Modern World discussions; and the outputs are improved discussion quality and learning evidence as students complete the SRL cycle.

Figure 1. This schematic diagram shows how



students' perceptions of motivational practices, goal setting, and personalized learning are examined in relation to teaching strategies in Mathematics in the Modern World, with sex used as a grouping variable for analysis.

3. METHODOLOGY

This chapter will present the research design, locale of the study, respondents of the study, research Instruments, data gathering, statistical technique and ethical considerations.

Research Design

This study will employ a quantitative research design, specifically a descriptive–correlational method. Descriptive statistics (means and standard deviations) were used to determine the level of students' perceptions for each factor. Independent-samples t-tests were conducted to test for significant differences in perceptions across sex. At the same time, Pearson product-moment correlation coefficients were computed to examine relationships among motivational practices and experiences, goal setting and accomplishments, and personalized learning. Statistical significance was set at $\alpha = .05$. Where relevant, effect sizes (Cohen's d for t-tests, r^2 for correlations) were also interpreted.

The descriptive–correlational design is appropriate, it enables the researcher to (a) quantify students' perceptions through standardized survey instruments, (b) identify patterns and differences across groups, and (c) analyze the strength and direction of relationships without manipulating variables. This design has been widely used in mathematics education studies where the goal is to explore associations between instructional practices, learner characteristics, and perceptions (Mutawah et al., 2017; Říčan et al., 2022).

Locale of the study

This study was carried out at San Isidro College in Malaybalay City, Bukidnon, Philippines. It is a private Catholic higher education institution and is considered one of the academic hubs of the province. The location was choosen for the convience of the researcher and also it has a diverse learners.

Respondents of the Study

The participants in this study focused on students who are currently enrolled to the subject of Mathematics in the Modern World (MMW) both male and female. This students is suites to be a respondents hence they are enrolled to mathematics classes where teaching and learning strategies involving motivational practices, goal setting, and individualized learning were being used.

Research Instruments

An adequate research instrument was necessary to help the researchers' collect data that are in line with the aims of the study in a systematic manner. It was significant that a properly designed tool be used to guarantee that the data obtained would be trustworthy, of the same nature, and directly connected to the research problem. Considering that the study was about the degree to which students recognized motivational practices and experiences, goal setting and accomplishments, and personalized learning as a means of teaching strategies in mathematics classroom discussions, a survey questionnaire was identified as the most appropriate instrument. Questionnaires offer the opportunity to gather data in a short time from a large number of respondents, facilitate the quantitative analysis, and give standardized measures of students' perceptions for different groups.

A structured survey questionnaire was the main tool of the primary research for this study. The tool was adapted from Comighud et al. (2020) in their study Factors on Memory Retention: Effect to Students' Academic Performance in Mathematics. The instrument was originally aimed at measuring student related factors in mathematics learning and it had already been locally validated. Therefore, it is considered reliable for the present study. In this research, only the subscales of motivational practices, goal setting, and personalized learning were kept to correspond with the specific focus of the study. The items were not changed to save their original validity; the adaptation was about selecting the relevant subscales and keeping the item wording for clarity and relevance. Researchers, who will carry out similar studies, may take the adapted instrument and test its validity further to confirm its suitability in different educational contexts.

Data Gathering Procedure

The data for this study were collected using a structured questionnaire adopted from Comighud et al. (2020) to measure students' perceptions of motivational practices and experiences, goal setting and accomplishments, and personalized learning. Consistent with test-use best practices, not all variables from the source instrument were

used; only the subscales/items that aligned with the present study's constructs were retained. The research aimed to determine the level of these perceptions, identify differences when grouped according to sex, and examine the relationships among the three factors. The respondents were college students enrolled in the general education course Mathematics in the Modern World (MMW) at San Isidro College, selected through convenience sampling based on their availability and willingness to participate during the researcher's scheduled periods and the respondents' free time; thus, findings were context-bound and should be generalized with caution due to the non-probability nature of the sampling. In order to collect data in an easy way, the questionnaire was distributed digitally via Google Forms, and the link to the survey was made available through the class group chats and school communication channels. Prior to the survey, the students were informed about the objective of the study, their privacy was guaranteed, and they were requested to give their consent voluntarily. The directions given to the students were clear and standard as well as they were included in the form to guide them in answering. Every submitted form was instantly saved in a safe location, and the researcher then checked the responses for completeness and accuracy before inputting them for statistical analysis. The rules of accuracy, confidentiality, and respect for the participants were observed throughout the entire operation.

Sampling Technique

The research resorted to a convenience sampling technique and encompassed all college students who were formally enrolled in Mathematics in the Modern World (MMW) at San Isidro College during the data collection semester. Being a non random method, such an approach might have caused the occurrence of self selection bias in that only the responders were accounted for. In order to minimize this limitation, the researcher personally contacted students from different programs (like Education, Business, Nursing, IT, and Arts & Sciences) and also from different genders so that the sample's diversity would be increased. Even though proportional allocation was not utilized, the next research can better the representation by employing a stratified random sampling technique which would make it possible to have a more equal distribution of respondents from different student groups.

Ethical Consideration

Throughout this investigation, the researchers complied with highly moral and ethical principles. They made sure to follow these measures to protect the participants. First of all, they got the green light from the administration of San Isidro College to perform the study on students enrolled in Mathematics in the Modern World (MMW). The Google Form questionnaire included an informed consent statement that made it clear the study's purpose, the fact that participation was entirely voluntary, confidentiality was guaranteed, and a participant's right to leave the study at any time without a disadvantage. Only respondents who gave their consent were permitted to complete the survey. Confidentiality was strictly observed by not collecting personally identifiable information such as names or student numbers. Responses were coded and stored securely in a password-protected file accessible only to the researcher, and data were reported in aggregate form to prevent the identification of individual participants. To ensure academic honesty and transparency, the adapted instrument was properly credited to its original authors. Overall, the study was conducted in accordance with established ethical guidelines for educational research that will include respect for persons, beneficence, and justice which safeguarding participants' welfare throughout the research process.

4. RESEARCH RESULT

Table 1. Demographic profile of sex

Sex	Frequency	Percentage
Male	79	31.6
Female	171	68.4
Total	250	100

Table 1 presents the demographic profile of the respondents in terms of sex. Out of the 250 total respondents, 79 or 31.6% were male, while 171 or 68.4% were female. This shows that the majority of the participants were female.

Table 2. Level of students' perception of factors contributing to teaching strategies

Factors	Over-all Mean and SD	Interpretation
Motivational Practices and Experiences	4.27 ± 0.689	Strongly Agree
Goal Setting and Accomplishments	4.23 ± 0.676	Strongly Agree
Personalized Learning	4.22 ± 0.760	Strongly Agree

Table 2 summarizes students' perceptions of three factors that contribute to teaching strategies. On a 5-point scale, all dimensions reached Strongly Agree, with Motivational Practices and Experiences highest (M=4.27, SD=0.689), followed by Goal Setting and Accomplishments (M=4.23, SD=0.676) and Personalized Learning (M=4.22, SD=0.760). These closely clustered means and modest standard deviations indicate consistently positive views and relatively low variability across respondents.

Table 3. The significant difference in students' perceptions of factors across sex.

Factors	Over-all Mean	P-value	Decision
Motivational Practices and Experiences	4.2823	0.749	Accept
Goal Setting and Accomplishments	4.1620	0.489	Accept
Personalized Learning	4.2076	0.880	Accept

Table 3 reports independent-samples t-tests comparing male and female students' perceptions of the three factors. All p-values are above .05—Motivational Practices and Experiences (p = .749), Goal Setting and Accomplishments (p = .489), and Personalized Learning (p = .880)—so the null hypothesis of no sex difference is accepted for each factor. Over-all means remain high (4.28, 4.16, 4.21), indicating consistently positive perceptions regardless of sex.

Table 4. The significant relationship between motivational practices and experiences, goal setting and accomplishments, and personalized learning.

		Mean	R-value	P-value	Interpretation
Motivational Practices and Experiences	Personalized Learning	4.267	0.802	0.000	Significant
Goal setting and accomplishments	Personalized learning	4.225	0.774	0.000	Significant
Personalized learning	Motivational practices and experiences.	4.225	0.722	0.000	Significant

Table 7 shows strong, positive relationships among the three factors. Motivational Practices and Experiences correlates highly with Personalized Learning ($r = .802$, $p < .001$), Goal Setting and Accomplishments also relates strongly to Personalized Learning ($r = .774$, $p < .001$), and Personalized Learning correlates with Motivational Practices and Experiences ($r = .722$, $p < .001$). With means all high ($M \approx 4.22–4.27$), these results support H2: in MMW classes, students who experience richer motivational practices and clearer goal

setting also perceive greater personalized learning, suggesting that strengthening one area likely reinforces the othe

5. DISCUSSION

Students reported very high motivation overall (M≈4.27) for motivational practices and experiences, particularly on structured tasks such as tests, assignments, and active participation; the only relative dip appeared in solving word problems. This profile suggests that clarity, guidance, and timely feedback sustain engagement, whereas multi-step transfer problems still require scaffolding (e.g., worked examples → guided practice → independent application). The pattern is consistent with Self-Determination Theory, which states that need-supportive classrooms strengthen students' persistence (Deci & Ryan, 2000), as well as with research showing that goal-oriented practice improves self-efficacy and engagement (Schunk & DiBenedetto, 2020). Perceptions of goal setting and accomplishment were also high (M ≈ 4.23), with the strongest agreement found in items on active participation in goal-aligned activities and continuous review or monitoring. The least positive, but still positive, starting point of one's own self enhancement activities is one's own self enhancement activities. This implies that students respond to well defined, measurable goals set by the teacher but are still in need of support when it comes to planning and carrying out self-initiated extension activities. A similar line of argument is presented by Shum (2023), who found that students' motivation and performance are significantly enhanced when they are given clear academic goals, particularly in mathematics courses with structured and measurable learning tasks. Thus, students are eager to participate in teacher led activities for the attainment of goals, which is in line with the current study, and it is also consistent with the literature showing that explicit self-regulated learning (SRL) instruction gradually leads students to independent strategy use (Panadero, 2017).

Students in the personalized learning environment (M ≈ 4.22) highly rated lessons that align with their interests, chances to make choices, pacing that is flexible, and shared responsibility, while the statement "using my own techniques" got the lowest ratings. The above indicates that there is a requirement for structured autonomy, wherein students are allowed to make choices and, at the same time, they receive clear instructions on strategy. For instance, Cullen and Oppenheimer (2024) proved that autonomy supportive policies resulted in better class attendance and deeper learning of the subject, thereby showing how student-controlled choices can enhance both motivation and learning. Correspondingly, Chen's (2025) meta-analysis revealed that AI enabled personalized learning systems brought about a medium to large positive impact on mathematics achievement (g ≈ 0.70) along with a 0.42 standard deviation gain over traditional instruction, thereby highlighting the effect of personalized learning pathways.Collectively, the three tables indicate a strong, supportive climate in which clarity, goals, and personalization are functioning well; the actionable gap is helping students transfer strategies to more open-ended problem solving and to initiate their own extension activities.

As shown in Table 6, students reported consistently high perceptions of motivational practices and experiences (M=4.2823), goal setting and accomplishments (M=4.1620), and personalized learning (M=4.2076), with no significant differences by sex (p=.749, .489, .880, respectively). In practical terms, male and female students view teachers' motivational practices, goal-oriented routines, and personalization similarly, suggesting that current strategies are broadly inclusive and effective for both groups. This aligns with studies showing that well-structured, autonomy-supportive instruction reduces gender disparities in motivation (Vidhya, 2021; Boström & Bostedt, 2021) and that equitable, supportive environments yield comparable self-efficacy and engagement across sexes (Csizér & Albert, 2024; Radulović et al., 2022; Navarro-Patón et al., 2024; du Plooy et al., 2024).

Finally, strong, positive relationships were observed among the three constructs: Motivational Practices and Experiences ↔ Personalized Learning (r=.802, p<.001), Goal Setting and Accomplishments ↔ Personalized Learning (r=.774, p<.001), and Personalized Learning ↔ Motivational Practices and Experiences (r=.722, p<.001). Together with the high means (≈4.22–4.27), these findings support the hypothesis that motivation, goal setting, and personalization work synergistically in

Mathematics in the Modern World. Practically, strengthening any one area is likely to reinforce the others, while recognizing that correlation does not establish causation. Related evidence shows that reflective goal-setting interventions improve achievement and engagement, especially when paired with motivational feedback (Dekker et al., 2023), that prompting students to set specific, attainable goals cultivates self-regulation and sustained motivation (Martins et al., 2025), and that personalized frameworks further heighten motivation and enjoyment when implemented with supportive guidance (Mötteli & Keller, 2023; see also Prananto et al., 2025).

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, the following conclusions were made:

Students indicated that motivational support, goal achievement, and personalized approaches were all helpful to them during mathematics discussions. It seems that classes that emphasize students as the focus of the work (where talk matters), facilitate engagement during the study of number concepts.

There were no noticeable differences between male and female students on any of the three areas, suggesting that these instructional strategies are generally equitable and work in similar ways for learners regardless of gender.

The three elements of motivational dispositions, personal gains, and goal-setting not only work in concert, but can also facilitate each other in meaningful ways. This suggests that by cultivating motivation, collaboratively creating goals, or personalizing learning pathways, students are more likely to experience ongoing engagement, or to facilitate productive math discourses, because they create an energizing cycle.

Based on the findings and conclusions of the study, the following are the recommendations:

To improve your instructional practices in Math in the Modern World, we invite you to use a framework for each session that consists of the following organized approach: “Motivate – Goal – Personalize.” Begin with small relevance hooks to create motivation, as well as collaboratively set learning goals that are specific and proximal with the students. Lastly, provide differentiated tasks and supports, examples include a choice of problem contexts, multiple representations, or tiered tasks. Using this framework along with the discussion routines, examples include quick-writes, think-pair-share, small group math talks, and whole class synthesis, will make reasoning visible to students, increase student engagement, and support students in making sense of their motivation and goals into mathematical discussion.

In order for all students to have equitable learning experiences, faculty need to observe participation across the broadened learning community and rotate the roles students play in these groups so that opportunities to speak, articulate, and lead are presented equitably to different sexes and programs. Creating flexibility in access to course materials (e.g., providing printable, low-bandwidth, etc.) that prioritize quality of reasoning over speed in terms of verbal responses and multiple modalities to demonstrate understanding, all support inclusive participation by students and are demonstrated strategies for equally benefiting a broad range of learners.

In an effort to enhance course management and assessment practices, teachers might display goals overtly via simple trackers (lesson goal, evidence of progress, next step), delivering short, timely feedback according to these goals. Program leaders could then complement teachers' tracking processes with short end-of-topic perception "pulses" that would solicit responses to prompt questions about the students' motivation levels, progress toward their goal and goal personalization at the end of each topic, alongside a checklist of observations about levels of autonomy support, clarity of goal, and differentiation. In regular planning sessions, teams could review the data collected in order to make specific adjustments to instruction and ensure consistency between their sections in the implementation of student-centered instruction.

7. ADVANCED RESEARCH

For future inquiry and capacity building, we recommend that departments offer faculty workshops specifically focused on co-setting goals, formative feedback, and differentiated task design, while also engaging in cycles of peer observation with structured and low-stakes feedback. Future research should increase generalizability through stratified random sampling within and across programs and

sections, triangulate surveys with classroom observations or focus groups, and model predictive relationships between motivation, goals, and personalization (e.g., regression or structural equation modeling). We also recommend continued validation of adapted subscales to ensure they fit well for measuring the local context.

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