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The Model "SMART"- an Innovation for Achieving Future Success in TVET Students: An Empirical study

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ABSTRACT: The "SMART" school innovation project represents a significant advancement in addressing the challenges faced by students in technical vocational education and training (TVET) programs, particularly concerning their mathematical proficiency. Recent analyses of state matriculation exam results have highlighted a troubling decline in mathematics achievement among students, which poses a substantial barrier to their academic and professional success in TVET learning classes. In response to this issue, the SMART project has been designed to enhance students' academic performance while cultivating a more inclusive and engaging learning environment. At the core of the SMART project is a differentiated instruction approach to those groups' students according to their mathematical abilities. This method allows educators to tailor their teaching strategies to meet the diverse needs of students, ensuring that both advanced learners and those struggling with foundational concepts receive appropriate support. By creating specific groups- advanced, intermediate, and those with significant gaps—and regrouping students from different professions into new classes, the project enables targeted interventions that address individual learning needs. This approach allows for simultaneous instruction in mathematics across all new mixed-profession classes, enabling personalized support due to the equal curriculum and equal allocation of hours. This structured grouping not only helps in identifying and addressing knowledge deficits but also promotes a collaborative learning atmosphere where students can thrive. The project emphasizes the importance of regular progress monitoring, with systematic evaluations conducted every two months. This ongoing assessment enables educators to make timely adjustments to teaching strategies and group placements, ensuring that students are continuously challenged and supported. Furthermore, the project incorporates innovative and interactive teaching methods designed to engage students actively in the learning process, moving away from traditional, monotonous approaches. By establishing a comprehensive framework for educational improvement, the project not only seeks to elevate students' proficiency in mathematics but also aims to create a holistic approach to learning that prioritizes the diverse needs of all learners. The SMART project is poised to make a lasting impact on the educational landscape, equipping students with the necessary skills and confidence to excel in their future studies and professional endeavors. By addressing the root causes of low mathematics achievement and fostering a supportive learning environment, the project aims to prepare students for the challenges they will face in both their academic and career paths.

KEYWORDS: personalized learning, grouping, TVET.

INTRODUCTION

After conducting an analysis of the results of the state matriculation exams over the past few years, in which mathematics was a mandatory exam subject, as well as in accordance with professional profiling and specialties in a National Vocational School in Sofia, an important trend emerges: a low average level of achievement in mathematics is observed. The concerning trend: a persistent decline in students' mathematics proficiency, particularly among those enrolled in vocational programs, grows to be nationwide, without any significant educational policy as a 'remedy'. This deficiency significantly hinders students' ability to grasp the mathematical concepts and computational skills required for their chosen fields of study.

Term clarification and definition

For the scope of the article "*model SMART*" and "*plan SMART*" or "*project SMART*" are intentionally chosen to be *operationally synonymous with equal meaning*, both referring to a comprehensive framework for educational innovation. While "*plan*" emphasizes the model's theoretical and methodological aspects, "*project*" highlights its practical implementation and operational procedures that were used for the implementation as an innovative project within the National Vocational School in Sofia, Bulgaria. The term

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plan is accenting on the methodical and didactical concepts and aspects of the model, and the term "project" emphasizes on the operational and implementational procedures. The model SMART was once made as a detailed conceptual plan, then operationalized as a project and implemented as an innovation in a National Vocational School in Sofia.

The proposed model emphasizes strengthening TVET outcomes through a foundational focus on mathematics at the beginning of TVET education. Mathematics plays a crucial role in engineering education, serving as a foundation for problem-solving and essential skill development, with students often reporting improved mathematical competencies after advanced courses (*Zeidmane et al.,* 2018). To bridge mathematics and engineering further, online learning models have been introduced to make mathematical concepts more accessible in engineering contexts (*Bilbao et al*., 2020). However, teaching mathematics in engineering faces challenges due to rapid technological advancements and evolving educational demands (*Prabakaran*, 2021). Addressing these issues calls for innovative approaches like competency-based education and mathematical competency mapping, which aim to build high-level skills and prepare students for AI-supported decision-making processes (*Karney* 2019; *Sipos & Kocsis*, 2024). Numerous studies confirm that teaching mathematics is essential for establishing a strong foundation in engineering and professional education, as it enhances the effectiveness of learning and the application of technical and analytical skills (*Rusmar & Mustakim,* 2017*; Prabakaran,* 2021*; Iyer et al.,* 2023).

The project SMART consists of differentiated grouping of students according to their levels of acquired knowledge in mathematics. This grouping will be based on an initial assessment, which will determine the level of each student and in which group they should be included. After the formation of the groups, at the beginning of the 2023/2024 academic year, a unified timetable will be prepared, in which all parallel classes of the respective grade will have mathematics classes at the same time. This will allow the regrouping of students according to their levels in mathematics, regardless of their specialty, and their inclusion in the classes of the corresponding group. Positive effects on differentiation on maths are shown by the empirical research of *Prast et al.* (2023), *Černilec et al.* (2023), especially with intensive positive effect on gifted student *Reed* (2004), Basister *& Kawai* (2018). Recent studies have examined the effects of differentiated instruction and ability grouping on mathematics achievement in secondary schools. Differentiated instruction has been shown to significantly improve student performance and confidence in mathematics, particularly for struggling students (*Awofala & Lawani*, 2020; *Aguhayon et al.,* 2023).

Research suggests that grouping students of varied abilities based on academic achievement is one of the most effective approaches to teaching mathematics (*Muchiri & Njenga,* 2020). *Kusmaryono et al.* (2021) propose an intriguing approach to forming groups, emphasizing that intelligence should be assessed across multiple domains. Perspectives on grouping strategies vary, ranging from multi-intelligence-based selection to friendship-based group formations (*Widodo et al.,* 2023).

The concept and structure of the plan "**SMART**", each word abbreviated from **S**kill- Focused on **M**aths, **A**daptive, **R**esilient and **T**argeted Plan; in Bulgarian it is abbreviated with word "***mind***" with meaning each word as "*successful in maths for better VET*" are designed to enhance the educational outcomes for both strong and motivated students in key subjects, particularly Mathematics and Bulgarian Language and Literature. The detailed structure of the conceptual plan of the innovation is:

- **Objective**: The primary goal of the plan is to improve the knowledge and skills of strong students while also supporting the progress of those who are lagging behind. This dual focus aims to create a more balanced educational environment.
- **Target Audience**: The project is aimed at students from the National High School of Mathematics and Natural Sciences "M. Lomonosov," specifically those in grades 8, 9, and 10.
- **Methodology**: The project proposes a differentiated instruction approach, where students are grouped based on their proficiency levels in Mathematics. This allows for tailored teaching strategies that meet the specific needs of each group.

Essential moments of the "SMART" project

- *Identification of problems in mathematics education*: Observed low level of achievements, difficulties in mastering the mathematical apparatus, need for differentiated education.
- *Structuring the groups*: Formulation of three main groups with different level of progress (advanced, intermediate level, significant gaps).
- *Differentiated learning*: Building individual progress plans and adapting the curriculum to the needs of students.
- *Teaching methods*: Using innovative and interactive methods to engage students to reduce monotony in classes.
- *Progress monitoring*: Systematic evaluation of students' progress every two months, with the possibility of moving between groups depending on the results achieved.

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- Potential benefits of the project: Improvement of students' motivation and success, increase of knowledge and skills, as well as preparation for future challenges in education and professional realization.
- *Communication with institutions*: Enforcing effective communication with educational institutions to exchange experience and obtain expert recommendations on working with students with gaps.

Expected Outcomes

The project aims to provide additional knowledge and skills to talented students while also addressing the needs of those who are struggling, ultimately leading to improved academic performance across the board.

This structured approach ensures that all students receive the support they need to succeed, fostering a competitive and collaborative learning environment.

The Developmental Phase of The Project "SMART" Includes:

1. **Organizational Planning**: This phase is set to last for 3 months during the summer of 2023. It involves the organization and distribution of teachers from the respective subject committee.
2. **Initial Assessment and Grouping**:
   - A comprehensive assessment will be administered to all students at the beginning of the academic year to gauge their current mathematical abilities.
   - Based on the assessment results, students will be grouped into homogenous classes according to their proficiency levels.
3. **Team Structure**: The project proposes a division into two teams for teaching mathematics:
   - **First Team**: Comprising three groups with three teachers, covering classes 8a, 8b, and 8v.
   - **Second Team**: Comprising four groups with four teachers, covering classes 8g, 8d, 8e, and 8j, but scheduled at different times from the first team.
4. **Group Composition**: The second team will have four groups categorized as:
   - Group A: Advanced students
   - Groups B and D: Average students
   - Group C: Students with gaps in knowledge
5. **Targeted Instruction with Unified Timetable**:
   - A unified timetable will be implemented, ensuring that all classes within a grade level have their mathematics classes at the same time
   - Teachers will be able to deliver tailored instruction to each group, addressing specific learning needs and building upon students' existing knowledge.
   - This personalized approach will promote a deeper understanding of mathematical concepts and enhance problem-solving skills.
6. **Potential Expansion:**
   - The success of this project in mathematics will inform the development of similar initiatives for other subjects, such as Bulgarian language and literature and foreign languages

Table 1. Key Components of the Project "SMART": summary

Key Component	Description
Initial Assessment And Grouping	Students will be assessed and grouped based on their mathematical abilities.
Unified Timetable	All classes within a grade level will have math classes at the same time, allowing for flexible regrouping.
Targeted Instruction	Teachers will deliver tailored instruction to specific groups, addressing individual needs.
Potential Expansion	The success of the project may lead to similar initiatives in other subjects.
Expected Outcomes	Improved math performance, increased student engagement, enhanced problem-solving skills, and a more equitable learning environment.

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A student's placement in a group will be determined by their progress and current performance. In order to track results, each student will be tested every two months. Upon meeting the criteria for a higher level, the student will be moved to the appropriate more advanced group. The expected effect of such grouping is the provision of equal conditions for all students within the same group, where they possess similar subject knowledge. In this way, teaching will be targeted and tailored to the specific level of the students, without being hampered by the need to compensate for larger gaps. In addition, in group C (for students with significant gaps), the teacher will conduct an analysis and systematization of the deficits at the beginning of the learning process, after which he will prepare a plan for their elimination. If necessary and with the approval of the school administration, this group can be provided with additional hours to catch up on material. This approach aims to both increase math results and improve discipline and learning motivation by placing students in groups with a relatively equal level of knowledge and skills.

Experimental implementation and expected preplanned results

Organizational and planning activities: ***Summer of 2023 (3 months)***

This is the key period during which the organization of the learning process and the allocation of teachers by the relevant mathematics subject committee must be carried out. For the successful implementation of the plan, two parallel stages are foreseen:

1. Distribution of teachers and formation of study units

The National Vocational School "Lomonov" has four mathematics teachers, and the eighth and ninth grades include seven classes. In order to optimize learning and achieve the necessary differentiation of knowledge, I suggest that the distribution be carried out in the following way: the mathematics lessons will be held simultaneously in two units, or "team" groups, which will cover all seven classes:

- *First teachers' team:* It will cover three groups with three teachers, with classes held simultaneously for grades 8a, 8b and 8c.
- *Second teachers' team:* It will include four groups with four teachers, with classes held simultaneously for grades 8d, 8e, 8f and 8g, but at different times than the First Team.

Given the presence of four classes in the Second Team, they will be divided into four training levels as follows:

- ✓ A group - advanced level
- ✓ B and D groups - intermediate level
- ✓ Group C – significant gaps

In order to increase learning motivation and competitiveness, different sub-levels can be distinguished in the two intermediate groups (B and D), setting criteria allowing more ambitious students to improve their knowledge and move to a more advanced group.

2. Curriculum preparation and institutional communication

This stage includes the planning and development of a curriculum for the first term of the academic year 2023/2024. If necessary, communication with various institutions (educational and methodical centers, consultants) will be carried out to obtain opinions and recommendations regarding work with students showing significant difficulties in mathematics. This communication will support the development of approaches and strategies to more effectively support students in group C, aiming at their gradual integration into more advanced groups and the permanent acquisition of key mathematical skills.

Positive predicted effects of the Project for School Innovation "SMART"

The school innovation project "SMART" has the potential to cause a number of positive effects on mathematics education in National Vacational School in Sofia, which can be summarized in the following key aspects:

1. Additional knowledge for teaching outstanding students

The project offers an innovative approach that aims to expand the learning material for gifted students. Through differentiated training and intensive activities, the enrichment of the knowledge and skills of these students is ensured, which not only increases their motivation, but also prepares future specialists with deeper knowledge in mathematics.

2. Motivation of students with lower success

The project aims to identify and systematically address the knowledge gaps of lower achieving students. Through targeted teaching methods, such as extra classes and individualized progress plans, weak students will receive the support they need. This

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approach can increase not only individual student success, but also the overall success rate of the graduating class, creating a more positive learning atmosphere.

3. Prevention of demotivation in strong students

One of the main problems in the traditional teaching system is the waste of time explaining gaps to weaker students, which often leads to demotivation of higher performing students. The UM project offers models where learning is structured to minimize the time spent reviewing old material for advanced students. This allows all students to receive adequate attention and stronger students to engage in new and challenging mathematical concepts.

4. Changing the idea of monotony in math classes

The project's innovative approach changes the static and uniformity inherent in traditional teaching. With specialized methods and resources, math classes will be enriched with new strategies and practices that engage students in an active way. Strong students will be able to learn new concepts, and weak students will receive additional time and attention to fill in their knowledge gaps, which will increase the effectiveness of the learning process.

5. Facilitation of theoretical and practical training

The innovative model of training in the "SMART" project facilitates both the theoretical and practical preparation of students in the higher grades of secondary school education. Better assimilation of knowledge and skills will lead to greater efficiency in learning and integration of new concepts and techniques. Additionally, improving classroom discipline and making the material easier to digest will provide students with the confidence and readiness to face the challenges of the future.

But it also has some challenges to be overcomed for successful implementation. These are summarized in ***Table 2.***

Table 2. "SMART" various shortcomings and challenges

Challenge	Description
Resistance To Change	Teachers and students may be hesitant to adapt to new methods.
Lack Of Resources	Insufficient resources and teacher training may hinder implementation.
Organizational Difficulties	Complex logistics and time management issues may arise.
Assessment Challenges	Subjective assessment criteria and difficulties in measuring progress can be problematic.
Heterogeneity Of Groups	Differences in students' prior knowledge and learning styles can impact the effectiveness of the approach.
Financial Limitations	Limited budget may hinder the full implementation of the project.
Maintaining Engagement	Sustaining interest among students and teachers over time can be challenging.
Communicating With Parents	Clear communication with parents about the project's goals and methods is crucial.

RESULTS AND ANALYSIS

The model was approved by the Ministry of Education as an Innovation and was due to be implemented in 2022- 2023 year and 4 years after.

In the survey the given the data "*before SMART*" meaning the year before the innovation was implemented, and "*after SMART"* for the school year 2022-2023. Data for the first term of 2024 cannot be still concluded and analyzed since the term is still ongoing.

The Bulgarian grading system uses a 6-point scale. A grade of 3 is the minimum passing mark, while 6 is the highest. A grade of 2 is considered poor, and 1 is no longer used in academic grading, as it previously carried a disciplinary connotation.

The first-year grades in Mathematics are presented and summarized in ***Table 3.***

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Table 3: Math grades in 2022-2023: summary data

Class 1st term (2022-2023)	Maths Grades			% Increment	Estimated expected next year by the same inc.
	last year grade	before SMART	After SMART		
Medical instrumentation- 8a	**3.60**	**3.20**	**4.10**	**22%**	**4.39**
Measuring Technics- 8b	**3.25**	**3.10**	**4.30**	**28%**	**4.16**
Cinetechnics and Audio systems -8c	**4.40**	**4.30**	**4.85**	**11%**	**4.90**
Optician technics- 8d	**3.80**	**3.60**	**3.85**	**6%**	**4.05**
Computer technics - 8e	**5.70**	**5.40**	**5.75**	**6%**	**6.00**
Computer technics -8f	**5.40**	**5.10**	**5.80**	**12%**	**6.00**

To analyze the effects of the SMART intervention on math grades, some performance statistics are drawn from the data, performance trends, class-specific impacts, and other potential interpretations of the data.

Descriptive Statistics for Overall Trends

- **Mean Grades**:
  - **Last Year Term**: 4.36
  - **Before SMART**: 4.12
  - **After SMART**: 4.77

There is a noticeable decline in grades from the previous year term to before SMART, possibly indicating a need for intervention. After SMART, grades significantly improve across the board.

- **Standard Deviation**: By examining the variation in grades across each period, we can gauge consistency:
  - **Last Year Term**: The variation could indicate the differences in performance among different classes prior to any interventions.
  - **Before SMART**: A higher variability may reflect different levels of initial adaptability to the curriculum.
  - **After SMART**: A reduced standard deviation here would suggest that SMART intervention helped align the classes more closely in terms of performance.
- **Percentage Improvement After SMART**:
  - On average, grades improved by around **0.65 points** after SMART, equating to a **15.8% increase** from the "Before SMART" period.
  - Each class benefited from the intervention, with **Measuring Technics- 8b** seeing the largest increase (up by 1.2 points, or about 38.7%).

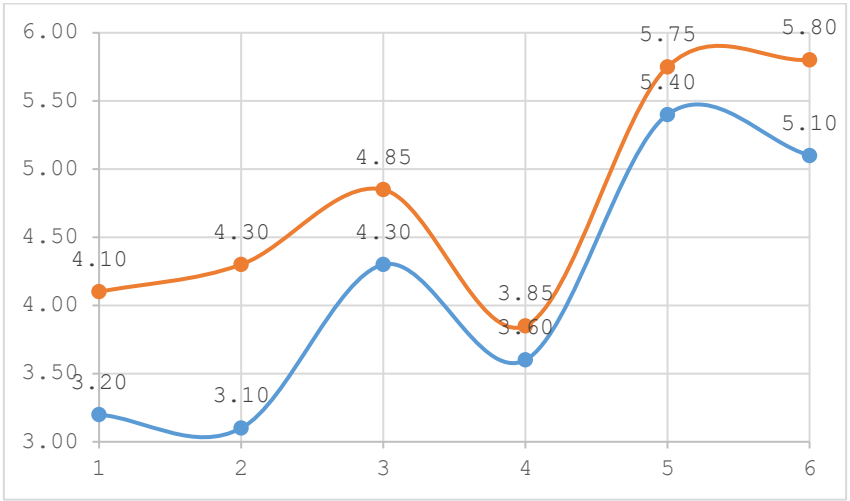

Figure 1. The effect of "SMART": a compare graph before and after the implementation.

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Class-Specific Observations for each class:

- *Medical Instrumentation - class 8a:*
  - *Before SMART*: Declined from the previous year term but showed significant recovery after SMART, increasing by 0.9 points.
  - *After SMART*: Improvement indicates the class responded well to targeted interventions, possibly benefiting from focused topics relevant to medical instrumentation.
- *Measuring Technics - class 8b:*
  - The largest increase after SMART, moving from 3.10 to 4.30, suggests that this class particularly benefited from the intervention.
  - *Interpretation*: The SMART program may have introduced practical, hands-on methods aligning well with measurement techniques, or the intervention may have addressed specific weaknesses in this class.
- *Cinetechnics and Audio Systems - class 8c:*
  - Smaller improvement (0.55 points) compared to other classes, though the grades were relatively high to begin with.
  - *Interpretation*: Since this class had one of the highest initial scores, SMART may have had a limited effect due to the already high baseline performance.
- *Optician Technics - class 8d:*
  - Minor increase (0.25 points) post-SMART, showing that this class had minimal benefit.
  - *Interpretation*: This could suggest that SMART may not have fully addressed the learning needs specific to optician technics or that the class may require a different type of intervention.
- *Computer Technics – classes 8e and 8f:*
  - Both groups improved, with **8f** seeing a slightly larger increase (0.7 points vs. 0.35).
  - *Interpretation*: Since both classes are in the same technical domain, SMART might have introduced tech-friendly, application-based learning approaches, which were more effective for **8f** than **8e**.

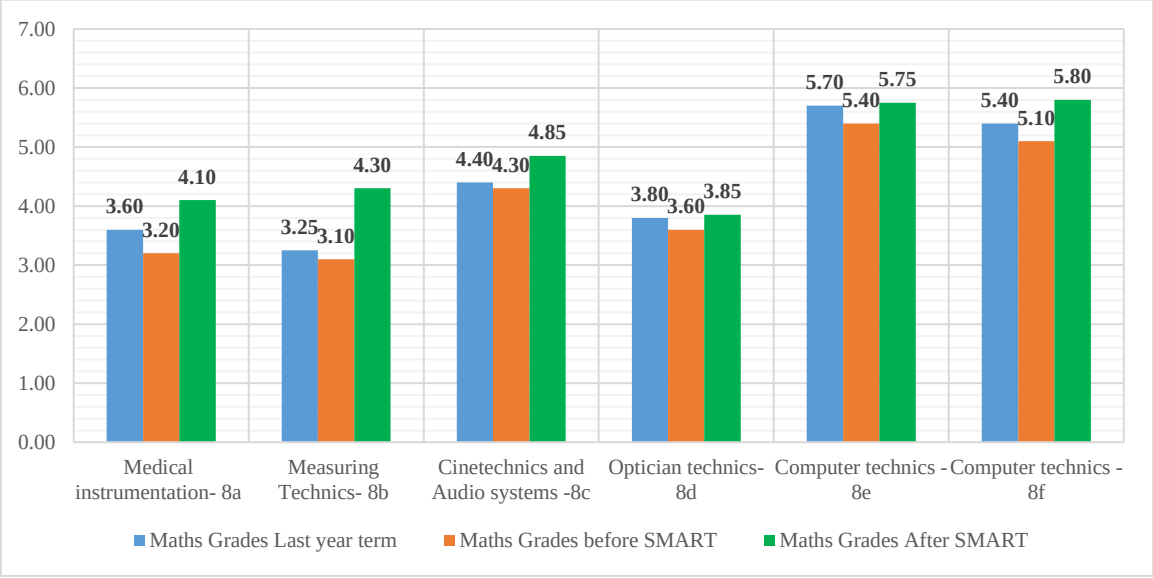

Figure 2. General results for each class with comparison of the year 2021 grades.

The analysis of the SMART intervention's impact on math grades reveals some significant insights into both overall trends and class-specific effects. Starting with the average grades, there was a noticeable decline from last year's term (4.36) to before the SMART program (4.12), indicating a possible need for targeted support. After implementing SMART, however, grades improved

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substantially, with an average score rising to 4.77. This increase reflects a 15.8% improvement from the pre-SMART term, with each class benefiting from the intervention. Notably, "Measuring Technics - 8b" experienced the highest increase, gaining 1.2 points, or approximately 38.7%, which may suggest that this class responded especially well to the SMART program.

Looking at individual classes, “Medical Instrumentation - 8a” initially declined before the SMART intervention but rebounded strongly afterward, with a 0.9-point increase. This could imply that the SMART approach aligned well with this class's needs, perhaps by incorporating practical or hands-on components suited to medical instrumentation. “Measuring Technics - 8b”, with the largest improvement, may have particularly benefited from SMART’s structured approach, as it appears to have addressed specific learning gaps or weaknesses. In contrast, “Cinetechnics and Audio Systems - 8c” showed a smaller improvement of 0.55 points, likely because this class was already performing at a higher level, meaning there was less room for improvement. This suggests that SMART had a limited impact where initial grades were relatively high.

The analysis of “Optician Technics - 8d” indicates only a minor increase post-SMART, suggesting that this class gained less benefit from the program. It’s possible that the SMART curriculum may not have fully addressed this class's unique learning needs or that alternative support strategies could be more effective. Finally, the “Computer Technics” classes (8e and 8f) both saw improvements, with 8f achieving a slightly larger increase of 0.7 points compared to 0.35 in 8e. This difference might indicate that certain application-based learning components in SMART resonated more with the students in class 8f.

Comparing the *pre-* and *post-intervention data* shows a clear improvement across all classes, demonstrating that SMART was generally effective. However, for some classes, the increase in grades was modest, suggesting that either they were already performing well or they may need additional support. The performance gap between higher-achieving classes like Computer Technics and lower-performing ones such as Measuring Technics narrowed after the intervention, highlighting SMART’s potential to equalize academic performance among students.

In terms of further statistical analysis, conducting tests such as t-tests or ANOVA help determine if the observed improvements are statistically significant for each class. Effect size calculations could also provide insight into the strength of the SMART intervention’s impact, while regression analysis might reveal whether initial grade levels predict the degree of improvement observed. This could inform future decision-making on where to focus educational resources.

Understanding the effectiveness of the SMART program requires recognizing the specific elements that contributed to these improvements. SMART’s focus on structured goals, practical applications, and personalized feedback appears to have worked well for most classes. However, the variability in grade improvements suggests that some groups may benefit from tailored interventions. For instance, while SMART was beneficial overall, classes like Optician Technics could require more specialized support beyond the general curriculum adjustments SMART provided. Additionally to mention, classes with high initial scores, such as those in Computer Technics, might benefit from more advanced materials, while lower-performing groups could need foundational support to maximize the program's effectiveness.

To build on these results, longitudinal tracking of grades over several terms could reveal whether the SMART program’s impact is sustained over time. Adjusting the curriculum based on ongoing feedback and performance data would also help refine its effectiveness. Further differentiation of the SMART approach, with additional resources for areas showing modest improvement, could enhance outcomes for all students. Piloting alternative techniques for specific classes, such as Optician Technics, could help determine whether different interventions might be more effective for certain groups.

Gathering student feedback on the SMART program could provide valuable insights into how they perceive these changes. Understanding what students find most helpful can reveal which components of SMART are most effective from their perspective. This approach to data-driven refinement ensures that while SMART is effective on a broad level, it can continue to be tailored and optimized to meet the unique needs of each class, enhancing both academic performance and engagement.

Additional analysis was conducted using a paired t-test to compare the means data of two related periods: the grades for each class *before* and *after* implementing SMART. The goal is to determine if there is a statistically significant difference between the two conditions (before and after SMART).

The data was statistically processed using the advanced version of XLSTAT Cloud pack for Excel.

Hypotheses for Paired t-test:

- *Null Hypothesis (H_0):* There is no significant effect on the innovation comparing the grades before and after SMART.

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- *Alternative Hypothesis (H_1):* There is a significant effect on the innovation comparing the grades before and after SMART.

We performed the paired t-test on the grades for each class before and after SMART, and here are the results:

- *t-statistic*: -2.77
- *p-value*: 0.039

Interpretation of Results:

- The *t-statistic* of -2.77 is the value used to compare the difference in means relative to the variation in the data. The negative sign indicates that, on average, the grades after SMART are higher than before.
- The *p-value* of 0.039 is less than the commonly used significance level of 0.05, indicating that there is strong evidence to reject the null hypothesis. This suggests that the difference in grades before and after SMART is statistically significant.

Thus, based on the *paired t-test*, the data shows that ***the model SMART had a positive effect on students' grades across the six classes***.

Summary of Findings and Conclusions:

- The *paired t-test* indicates a significant difference in grades before and after SMART, implying that SMART intervention likely had a positive effect on students' individual performance.
- *SMART* appears to have a positive effect on individual class performance (as shown by the paired t-test) ***Figure 3.***

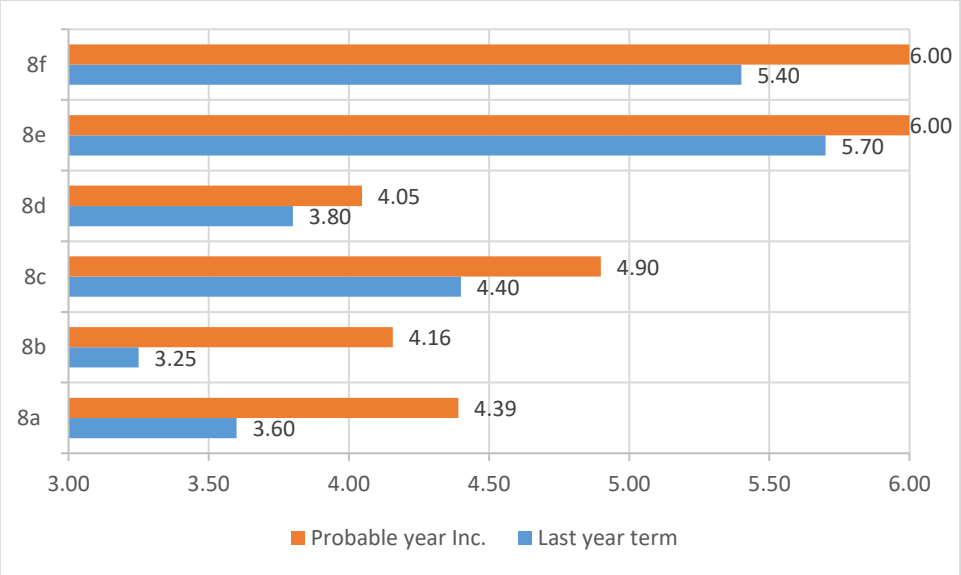

Figure 3. Estimated trend of probable next year grades based on the percentual trends shown in the first year.

DISCUSSION

The SMART project employs a multifaceted approach to enhance mathematics proficiency among students. Key strategies include differentiated instruction, where tailored teaching methods cater to varying levels of student ability. By grouping students based on their current performance and knowledge gaps, educators can provide targeted support. For instance, students with significant gaps are placed in a dedicated group where their specific deficits are analyzed and addressed through a structured plan. Active learning techniques are also a focus of the project, aiming to transform traditional, monotonous teaching methods by incorporating innovative strategies that engage students actively in the learning process. This includes the use of specialized resources and practices that stimulate interest and participation, allowing stronger students to explore advanced concepts while weaker students receive the necessary reinforcement. Regular assessment and feedback are crucial components of the project. Students are tested every two months, allowing for timely adjustments in teaching strategies and group placements. This continuous assessment ensures that students are appropriately challenged and supported, fostering an environment conducive to learning. Enhanced teacher collaboration is another important aspect. The project encourages collaboration among teachers, who are organized into teams to

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deliver simultaneous lessons across different classes. This structure not only optimizes resource allocation but also facilitates the sharing of best practices among educators, ultimately benefiting student learning outcomes.

The decline in mathematics achievement among students in vocational programs has significant implications for their academic and professional futures. A decrease in mathematics proficiency can hinder overall academic performance, as mathematics is foundational to many vocational subjects. Insufficient mathematical skills may lead to difficulties in understanding technical concepts, which are often quantitatively driven, thereby affecting students' ability to succeed in their chosen fields.

Moreover, many vocational careers require a solid understanding of mathematical principles for tasks such as measurements, calculations, and data analysis. A lack of proficiency in mathematics can limit students' employability and readiness for the workforce, as employers often seek candidates who possess strong analytical and problem-solving skills. The decline in achievement can lead to decreased motivation and engagement among students. When students struggle with mathematics, they may develop a negative perception of their abilities, resulting in lower self-esteem and a lack of interest in their studies. This cycle of demotivation can further exacerbate academic challenges, creating a barrier to successful learning and personal development. The SMART project addresses these challenges by implementing targeted strategies that aim to improve mathematics proficiency, thereby enhancing students' academic performance and career readiness in vocational programs.

CONCLUSION

The SMART project represents a significant innovation in the approach to Mathematics education, particularly within vocational programs. By implementing differentiated instruction, active learning techniques, and regular assessments, the project aims to address the persistent decline in mathematical proficiency among students. This comprehensive strategy not only seeks to improve academic performance but also fosters a more inclusive and engaging learning environment within the context of VET. The far-reaching consequences of low mathematics achievement extend beyond academic success and into future career opportunities. The empirical study conducted as part of the SMART project provides valuable insights into its effectiveness, demonstrating statistically significant improvements in student grades following the implementation of the program. Summary data indicates that students' performance in mathematics has shown marked enhancement, with positive trends observed across various classes.

By focusing on tailored support and collaborative teaching methods, the SMART project endeavors to equip students with the necessary skills and confidence to excel in their next vocational studies and professional pursuits. The project's success could serve as a model for similar initiatives in other subjects, promoting a holistic approach to VET that prioritizes the diverse needs of all learners.

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