

Mejia, Ivy P. et al.

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Influence of teacher specialization and subject-taught mismatch on students' learning outcomes

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Influence of Teacher Specialization and Subject-Taught Mismatch on Students' Learning Outcomes

Ivy P. Mejia, Alvin D. Tenorio, Richard P. Monteverde, Arlyne C. Marasigan, Jayson L. De Vera, Nilo J. Castulo, Cathlene P. de Pano, Leih Maruss Sinsay-Villanueva, Glenda Darlene Garcia, Valerie Lim, Ivan Harris Tanyag, and Jenard Berroya

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Abstract:

Mismatches between teacher specialization and subjects they teach continues to be an ongoing challenge in the Philippine education system. It affects both pedagogical effectiveness and student learning outcomes. This study sought to investigate the degree of subject-taught mismatch, its influence on student performance, and the underlying factors that contribute to this misalignment. It employed a mixed-methods approach, integrating quantitative analysis of the extent of teachers' specialization and subject-taught mismatch and its relationship with student examination scores with qualitative data from teacher interviews and surveys. The methodology encompasses an examination of existing datasets, the collection of primary data through surveys and interviews, and the statistical analysis of student performance metrics. Results showed a moderate positive relationship between teacher specialization alignment and students' examination scores, suggesting that learners taught by specialized teachers generally exhibit higher levels of achievement. Findings also revealed that teachers frequently encounter multiple misalignments, rather than a single mismatch, between their specialization and assigned subjects. Furthermore, qualitative feedback revealed that teachers teaching outside their field of specialization experienced difficulties including decreasing confidence, heightened preparation time, and issues in addressing student misconceptions. The study highlights significant policy implications, such as the necessity for systematic teacher recruitment and assignment procedures that promote specialized alignment, improved professional development programs for out-of-field teachers, and reinforced collaboration among educational institutions. To alleviate adverse consequences of subject mismatch, educational organizations must establish specialized training programs, enhance workforce planning, and cultivate supportive learning environments for educators and learners. This is crucial for enhancing teaching quality, improving student outcomes, and developing a more effective approach to aligning teacher specialization with subject assignments within school realities in the Philippines.

Keywords: educational policy, professional development, subject-taught mismatch, student learning outcomes, teacher specialization

Table of Contents

1. Introduction	1
1.2. Contributions of the study	2
2. Review of related literature	3
2.1. Defining teacher-subject mismatch	4
2.2. Issues and concerns with teacher-subject mismatch	11
2.3. Policies pertaining to teacher-subject matching (DepEd)	14
2.4. Effect of teacher-subject mismatch on academic achievement of students	16
2.5. Interventions in addressing teacher-subject mismatch	17
2.6. Synthesis of the review of related literature and studies	20
3. Methodology	21
3.1. Conceptual framework	21
3.2. Research design	22
4. Results and Discussion	28
4.1. Professional profiles of teachers related to their specialization and subject(s) taught	28
4.2. Extent of teacher's specialization and subject-taught mismatch	32
4.3. Teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their first quarter examination scores	36
4.4. Teachers' insights about the importance of their specialization and the actual subject(s) taught in relation to their students' learning outcomes	38
4.5. Key findings and policy implications	45
5. Conclusion and recommendations	47
6. References	58

List of Tables

Table 1. Research gaps on teacher-subject mismatch	20
Table 2. List of secondary data	23
Table 3. Distribution of participants according to the grade level they handle	25
Table 4. List of qualitative methods	25
Table 5. Mapping of study objectives and the corresponding data and analyses	27
Table 6. Region of origin of participants	29
Table 7. Distribution of teachers by grade level taught	31
Table 8. Distribution of respondents according to the matching of specialization and subjects taught	33
Table 9. Distribution of the number of mismatched teachers per subject	35
Table 10. Distribution of respondents according to the number of mismatched subjects handled	36
Table 11. Results of the correlation between teacher specialization-subject alignment and students' departmental exam scores	38
Table 12. Table summary of codes on student engagement, classroom dynamics, and learning outcomes	39
Table 13. Table summary of codes on impact on student learning outcomes	40
Table 14. Table summary of codes on challenges of teaching outside specialization	41
Table 15. Table summary of codes on professional development gaps and trainings	42
Table 16. Table summary of codes on systemic barriers	43
Table 17. Table summary of findings	45

List of Figures

Figure 1. Conceptual framework of the study	21
Figure 2. Data triangulation	26
Figure 3. Undergraduate specialization of teacher respondents	31
Figure 4. Subjects being taught by teachers	32

List of Acronyms

ARMM	Autonomous Region in Muslim Mindanao
BARMM	Bangsamoro Autonomous Region in Muslim Mindanao
BEEd	Bachelor of Elementary Education
BSEd	Bachelor of Secondary Education
CAEP	Council for the Accreditation of Educator Preparation
CALABARZON	Cavite, Laguna, Batangas, Rizal, and Quezon Province
CAR	Cordillera Administrative Region
CHED	Commission on Higher Education
CLT	Communicative Language Teaching
COD	Center of Development
COE	Center of Excellence
COVID-19	Coronavirus Disease
DepEd	Department of Education
df	degrees of freedom
DO	Department Order
ECED	Early Childhood Education
EDCOM 2	Second Congressional Commission on Education
EFL	English as a Foreign Language
ELL	English Language Learner
ESP	Edukasyon sa Pagpapakatao
FaSMEd	Formative Assessment in Science and Mathematics Education
FGD	Focused Group Discussion
HEIs	Higher Education Institutions
IPCR	Individual Performance Commitment and Review
K-12	Kindergarten to Grade 12
KII	Key Informant Interview
LET	Licensure Examination for Teachers
MAPEH	Music, Arts, Physical Education, and Health
MATATAG	Makabagong Kurikulum, Talino, Tapang, and Galing
MIMAROPA	Mindoro (Occidental and Oriental), Marinduque, Romblon, and Palawan
MMR	Mixed-Methods Research
MSU	Mindanao State University
NAT	National Achievement Test
NCR	National Capital Region
NEAP	National Educators' Academy of The Philippines
NGO	Non-Governmental Organization
NISMED	U.P. National Institute for Science and Mathematics Development
NPM	Near-Peer Mentoring
OECD	Organisation for Economic Co-Operation and Development
OIC	Officer-in-Charge
OOF	Out-of-Field
OPCR	Office Performance Commitment and Review
p-value	Probability value
PCK	Pedagogical Content Knowledge
PISA	Programme for International Student Assessment
PNU	Philippine Normal University
PPST	Philippine Professional Standards for Teachers

PSG	Policies, Standards, and Guidelines
r	Pearson's r (correlation coefficient)
RAs	Research Assistants
SES	Socioeconomic Status
SHS	Senior High School
SMK	Subject Matter Knowledge
SOCCSKSARGEN	South Cotabato, Cotabato, Sultan Kudarat, Sarangani and General Santos City
SOPI	Student Outcome Perception Interview
ST	Subject-Taught
STEM	Science Technology Engineering and Mathematics
SUC	State University College
SY	School Year
TECHVOC	Technical and Vocational Education
TEI	Teacher Education Institutions
TESDA	Technical Education and Skills Development Authority
TLE	Technology and Livelihood Education
TS	Teacher Specialization
TVET	Technical and Vocational Education and Training
UP	University of the Philippines
UP CE _d	UP College of Education
US	United States
WVSU	Western Visayas State University
ZPD	Zone of Proximal Development

Influence of Teacher Specialization and Subject-taught Mismatch on Students' Learning Outcomes

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1. Introduction

Teacher specialization and subject-taught mismatches occur when educators are assigned to teach subjects outside their formal area of education and training (Luft et al. 2020). This can significantly impact both the quality of teaching and student performance (Ball et al. 2008, Campbell et al. 2014, Condie et al. 2011, Jacob and Rockoff 2011, Johansson and Myrberg 2019). In terms of teaching quality, teachers lacking specialization in a particular subject area often possess a limited depth of knowledge and expertise necessary for effective instruction (Ball et al. 2008). Their incomplete understanding of the subject poses challenges in presenting complex concepts clearly. Conversely, subject-specialized teachers are generally more proficient in employing effective teaching strategies tailored to their specific discipline. For example, a teacher with a background in mathematics is likely to use a variety of pedagogical approaches suited to mathematical instruction, whereas a teacher with a background in literature may rely on fewer methods due to a lack of expertise in other subjects (Ball et al. 2008). Subject-taught mismatch also influences student performance and learning outcomes (Ball et al. 2008; Johansson and Myrberg 2019). When teachers are not aligned with their subject area, the intended curriculum may not be delivered systematically, impeding students' ability to build knowledge progressively. However, teachers who are well-versed in their subject can effectively break down complex material into manageable components, enhancing students' understanding and mastery of the content (Ball et al. 2008). This alignment allows for more differentiated instruction and better adaptation to students' needs.

Teacher specialization is an important consideration when assigning subjects to teach. Ideally, teachers should be equipped with specialized knowledge and skills that directly correspond to their teaching assignments. According to Department Order (DO) No. 13, series of 1994¹⁴, when hiring teachers and assigning them to subjects, preference is given to those who majored in specific subjects during their pre-service education. Therefore, a mismatch at the elementary level would involve teachers who have a degree in secondary education but are teaching at the

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¹⁴ DO No. 13 s 1994: Guidelines for matching specialization in teaching preparation with teaching assignments for public school teachers.

elementary level, while at the secondary level, a mismatch refers to teachers teaching subjects that do not align with their major during pre-service education. However, the reality in many educational systems is that teachers are often required to teach subjects outside their area of expertise. This occurs due to various factors, including teacher shortages, budget constraints, and administrative decisions; moreover, financial limitations prevent school heads from hiring qualified teachers to teach specialized subjects and force them to spread existing teachers across multiple subjects (Fulgado and Ison 2017).

This study explores several key policy issues and evaluation concerns. First, it examines the extent of the mismatch between teachers' specializations and the subjects they teach. Second, it investigates how this mismatch affects students' learning outcomes. Finally, it evaluates the importance of aligning teachers' specializations with their assigned subjects and proposes policies to address these mismatches, particularly within the Department of Education (DepEd), the Commission on Higher Education (CHED), the Technical Education and Skills Development Authority (TESDA), and the legislative branches (i.e., Senate and Congress).

The general objective of this study is to describe teacher's specialization and subject-taught mismatch which is necessary in informing recruitment policies and strategies of DepEd and CHED. The specific objectives are as follows:

1. To describe the teachers in terms of their professional profiles related to their specialization and subject(s) taught.
2. To analyze the extent of teacher's specialization and subject-taught mismatch.
3. To examine the correlation between teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their quarter exam scores.
4. To explore teachers' insights about the importance of their specialization and the actual subjects taught in relation to their students' learning outcomes.
5. To provide policy recommendations in terms of teacher recruitment and inputs to possible training programs that may be conducted to improve teacher effectiveness and student learning outcomes.

1.2. Contributions of the study

This study contributes to the Philippines' goal of upgrading its educational system through the analysis of the influence of teacher specialization and subject-taught mismatch on the learning outcomes of the students. The findings from this research provide policy perspective to

policymakers, particularly those within DepEd¹⁵, CHED¹⁶, TESDA¹⁷, the legislative branches, teachers, and teacher education institutions (TEIs).

We contribute to the basis of government to ensure that teachers are teaching within their area of specialization, foster partnerships among relevant agencies and TEIs to provide more capacity building programs and training for teachers and students, and provide guidance on recalibrating the pre-service training and courses of teachers to expand their knowledge and pedagogical adaptation. Guided by evidence-based insights, policymakers will be able to refine laws that are more focused on teacher deployment, specialization alignment, and professional development.

Findings can help shape policies that establish clear standards and guidelines for teacher assignments, ensuring that educators are placed in roles that align with their qualifications and expertise. The study also emphasizes the need for a more structured approach to teacher placement by examining the impact of subject-specialization mismatches. This approach would involve a systematic process for assessing teacher competencies, matching them with subject and grade-level requirements, and addressing any gaps through targeted professional development programs. It would also incorporate monitoring and evaluation mechanisms to secure compliance and long-term effectiveness, as well as better preparation for pre-service teachers and the development of future-ready policies. Furthermore, it highlights the need to move away from inconsistent or ad-hoc teacher placement practices and adopt a more strategic framework: one that prioritizes not only teacher preparation but also well-being, job satisfaction, and student learning outcomes.

2. Review of related literature

Teacher-subject mismatches have significant negative impacts on the quality of education, leading to learning gaps and decreased student competence (Mercado 2023). Additionally, Harvanto (2021) highlighted the necessity for additional training for teachers who are not teaching within their area of specialization. In literature, mismatch can be used interchangeably with "out-of-field teaching". It is the practice of sending teachers to teach disciplines for which they do not have specialized credentials (Hobbs 2013; Shah et al. 2022; Sharplin 2014). Out-of-field teaching is a global phenomenon, especially in mathematics education (Goos et al. 2020, 2023; Shah et al. 2022). It can have a negative impact on the work of teachers, the learning of students, as well as the well-being, confidence, and self-

¹⁵ The department is responsible for overseeing the basic education system in the Philippines, which includes both public and private schools from kindergarten to Grade 12, as well as early childhood education (ECED) to some extent. Its primary mandate is to ensure equitable access to quality education for all Filipino learners. The key responsibilities of the department include, but are not limited to, curriculum development, school management, teacher training and development, and education planning and budgeting

¹⁶ CHED manages the higher education system in the Philippines, which includes colleges, universities, and higher education institutions. Its primary mandate is to promote and regulate the quality of higher education in the country. Key roles of CHED include, but are not limited to program development and accreditation, scholarships and financial assistance, research and development, and policy regulation.

¹⁷ TESDA is specifically mandated to oversee technical and vocational education and training (TVET) in the Philippines. Its primary mandate is to provide skills development opportunities to enhance the employability of Filipinos and contribute to the country's economic growth. TESDA's key programs include skills training and competency certification. It also manages TVET institutions accreditation and industry partnerships.

efficacy of teachers (Du Plessis and McDonagh 2021, Shah et al. 2022, Sharplin 2014). Factors such as school autonomy, teacher shortages, and school environment factors, including school sector and the educational level of students' parents, impact the allocation of teachers to teach subjects outside their area of expertise (Shah et al. 2022; Sharplin 2014). Providing sufficient assistance tailored to the requirements of teachers is essential for effectively managing the teaching workload in subjects outside their area of expertise and cultivating a comprehensive understanding of the curriculum (Du Plessis and McDonagh 2021; Sharplin 2014). Professional development programs have been demonstrated to diminish out-of-field teaching while favorably impacting teaching methods and views about mathematics (Goos et al. 2020, 2023).

Inexperienced teachers who are not specialized in a specific topic typically lack the necessary understanding of the subject, which affects their teaching methods and ultimately hinders students' academic progress (Du Plessis et al. 2019; Ní Ríordáin et al. 2019). Out-of-field teachers confront challenges such as role-congruence, role-displacement, phase-displacement, role-stretched, and phase-stretched, which may contribute to job discontent and teacher attrition (Sharplin 2014). In certain countries, the scarcity of qualified teachers in essential disciplines and the ever-changing curriculum have led to a rise in the employment of out-of-field teachers, endangering education quality (Satimburwa et al. 2020).

There is a recognized lack of sufficient emotion-focused support for teachers, leading to imbalances in their seeking of support (Gavade et al. 2023). Results of a study on the professional development needs of teachers working in socioeconomically disadvantaged areas revealed a demand for further training in various areas. It includes learning support, utilizing digital media, addressing special educational needs, and managing diverse student populations (Weber et al. 2024). An all-encompassing strategy for professional development, which provides teachers with the necessary assistance to enhance education and enhance student performance, has been identified as a crucial component in aiding underperforming students (Johnson 2018).

2.1. Defining teacher-subject mismatch

2.1.1. Different perspectives on teacher-subject mismatch

Teacher-subject mismatch happens when educators are assigned to teach a subject outside of their formal preparation, making them underqualified for instruction (Ingersoll 2001). Administratively, it is the act of assigning teachers to teach disciplines in which they lack a specialized professional certification (Sharplin 2014; Van Overschelde 2022). It is a prevalent practice in several countries and may detrimentally affect the quality of education provided (Sharplin 2014; Vale et al. 2022). Moreover, teachers encounter obstacles such as insufficient understanding of subject matter and pedagogical challenges, limited resources, and low student enthusiasm when teaching subjects outside their area of major (Mercado and Morante 2024; Pacana et al. 2019). This problem of teacher-subject mismatch can lead to teacher turnover and challenges in professional growth and development, highlighting critical areas that require additional attention (Vale et al. 2022).

Student learning outcomes are negatively affected when teachers are assigned outside their areas of specialization. Numerous studies indicate that students that are taught by out-of-field teachers perform significantly worse on standardized tests compared to those taught by in-field specialists (Van Overschelde 2022). Moreover, teaching outside one's expertise has been

linked to higher dropout rates and even manipulation of school records in secondary schools (Costa et al. 2020).

EDCOM2 reported that teacher-subject mismatch was prevalent, with 62 percent of high school teachers in public schools teaching subjects they did not major in, due to a systematic issue in the hiring practices of DepEd, which are based on availability rather than specialization (Chi 2024). This also raises a concern that may reflect on the performance of students in the Programme for International Student Assessment (PISA)¹⁸, especially for subjects in Science Technology Engineering and Mathematics (STEM) that usually require specialized teaching styles and content knowledge. The Philippines first participated in PISA back in 2018 and scored 357 in science (lower than the OECD average, which was 489), with fifteen-year-old Filipino students also scoring lower in reading, mathematics, and science subjects compared to most participating countries (De La Cruz 2022). DepEd had already attempted to address the matter with the issuance of DO No. 13, s. 1994, which intended to “match the specialization in teacher preparation with teaching assignments in public schools”. Tenorio (2022) summarized that the issuance was meant to narrow the gap between teacher qualifications and subject assignments by encouraging new teachers to focus on specializations with better employment. However, the author went on to report that not all TEIs were able to offer the needed programs critical to producing specialized teachers.

Teachers’ professional qualifications are related to the quality of teaching by professionally competent teachers. For example, since secondary school teachers are required to learn/acquire a higher level of knowledge on science and math subjects to pass the Licensure Examination for Teachers (LET), student teachers from HEIs that offer specialized science programs would be more likely to pass the LET for the secondary teaching level (Generalao et al. 2022). However, it is worth recognizing that much of effective teaching cannot be fully captured through empirical studies or linked solely to student achievement. Quality teaching and learning draw on values, experiences, insights, imagination, and appreciation—elements that are not easily observed or measured (Aquino 2002, as cited by Guiaselon et al 2003).

Contrasting views in literature. Teacher-subject mismatch can be an issue rooted in structural inefficiencies within educational systems, particularly in teacher allocation and professional development. Teachers that are assigned to unfamiliar subjects may also lack support in furthering their training and learning opportunities, which can exacerbate the problem (Timperley 2008). The lack of professional development is a deeper systematic problem with the inadequacy of workforce planning and misaligned policies, which contribute to the mismatch between teacher skills and training. Additionally, Beteille and Loeb (2009) explained that teacher-subject mismatches are an indication of inequities within education systems, whereas underfunded schools, particularly in low-income areas, are more prone to mismatch due to a lack of qualified teachers.

Darling-Hammond (2010) discussed that misalignment worsens especially in underfunded or underdeveloped schools because these schools are more likely to be labeled as “low-performing” or “low-rated” based on the students’ overall test scores. It explained that the low rating of these schools is highly correlated to the students’ socioeconomic status instead of the knowledge they acquire relative to entering school; the causal effect of school labeling

¹⁸ PISA, developed by the Organisation for Economic Co-operation and Development (OECD), evaluates the skills and knowledge of 15-year-old students in mathematics, reading, and science. The 2022 assessment, which focused on mathematics, included participation from 81 countries and economies, with the results published by the OECD on December 5, 2023. Source: <https://www.oecd.org/en/about/programmes/pisa.html>.

regresses student achievement, reflecting poorly on the performance of teachers. Mangubos (2019) conducted a descriptive survey on misaligned Filipino teachers, the results summarized the perception of the educators teaching the mismatched subjects, ranked accordingly: teachers think that: (1) their teaching strategy is not effective; (2) they are not capable to share their knowledge and expertise; and (3) they do not find themselves effective in teaching—adding lastly, that “the mismatched subjects are more difficult than their major subject”. These lead to detrimental effects on teacher morale (Bosso 2017; Mackenzie 2007, as cited in Willis and Varner 2010), and ultimately teacher professional development (Fonén and Ukkonen-Mikkola 2019; Seinert et al. 2019, as cited in Padillo et al. 2021). Pacaña et al. (2019) reported that some schools in Cebu did not treat mismatching as a severe problem, rather, the schools left it to their teachers to make the adjustments without support. It was later on revealed in the study that teachers were mistreated, and the out-of-field teaching resulted in self-esteem issues with their expert social studies educators.

Implications on teacher recruitment and teacher retention are triggered by a compounding of mismatches from hiring of underqualified teachers (Carothers et al. 2019). Teacher-subject misalignment becomes a disadvantage to schools since it becomes harder to recruit qualified teachers, evident in hard-to-staff schools in North Carolina resorting to lateral entry because of the increase in teacher turnover rate (Darling-Hammond 2010).

These misaligned gaps were highlighted during the coronavirus (COVID-19) pandemic, as there was a mismatch that was widely experienced in the process of shifting to remote learning. One of the challenges of online learning is the lack of access to adequate resources such as smart devices and reliable internet connection. In India, some teachers had to share devices with other family members (Dayal 2023). The transition to an online platform is especially a difficult undertaking for older educators, due to a lack of digital skills or prior experience, thus increasing stress, burnout, and a decrease in teaching effectiveness (Hargreaves 2021). Lastly, geographical inequalities in access to infrastructure amplified these problems, as there are teachers that reside in underdeveloped areas, and some schools also decreased salaries (Tadesse and Muluye 2020). The concept of out-of-field teaching is widely recognized; however, a comprehensive understanding of its occurrences across diverse contexts remains insufficient. The subsequent subsections categorize various forms of out-of-field teaching identified by the researchers.

2.1.2. Types or forms of mismatch

Based on academic training (major/minor) or state certification, there are different types of teacher-subject mismatch that can differ on the context and nature of the mismatch. These different types and forms also highlight the complexity of the matter, as there are also degrees of misalignment and contributing factors. Fuentes and Jimerson (2019) pointed out that mismatches in teacher assignments make it difficult for teachers to engage in meaningful dialogue, as well as to receive feedback that would support their improvement in teaching and student learning. In their study of 336 teachers, they emphasized the need to reform teacher education and development, particularly by addressing the disconnect between theory and practice in pre-service training.

Out-of-field (OOF) teaching. This is the most common type of mismatch when teachers are assigned to teach another subject outside of their expertise or formal training (Ingersoll 2001). Two major categories of this mismatch are enumerated by Du Plessis (2015) as *complete out-of-field teachers*, teaching only the subjects not specified on the teaching certificates; and the

other, *partial out-of-field teachers*, teaching subjects specified on the teacher’s teaching certificates (or other non-certified subjects). It occurs in both primary and secondary education levels, especially when schools face staff shortages (Hobbs and Porsch 2021).

Studies on rural division schools are able to expound on these types of vulnerabilities. Because teacher qualifications are empirical in studying subject mismatches, Guiaselon et al. (2023) were able to identify that educational qualification mismatches were high in the DepEd Maguindanao I Division, with only one out of nine mismatched teachers had a Master’s units, while their baccalaureate degrees were also academic mismatches with 2 Bachelor in Secondary Education (BSEd) Mathematics, 4 Agricultural Education, and 3 Agricultural Extension teachers were assigned to as part of the English faculty.

It should also be noted that both different grade levels require very different teaching techniques. Interestingly, an occurrence of a double mismatch in grade level and content area is also possible (Fuentes and Jimerson 2019).

Partial subject mismatch. In this case, teachers may have some background with the content knowledge of the subject yet lack the expertise or full certification for proper instruction. Some teachers have taken a minor in the subject which requires more advanced knowledge for teaching. This type of mismatch arises in under-resourced schools, with administrators forced to take on more instruction in the classrooms (Beteille and Loeb 2009). Another consequence of schools being short-staffed is the assignment of some teachers into out-of-field subjects together with their in-field subjects. Kim (2011) categorized these partial mismatches according to their severity:

1. Category 1: teachers teach the subjects other than their major subjects specified on their teaching certificates;
2. Category 2: teachers teach the subjects other than their minor subjects specified on their teaching certificates; and,
3. Category 3: teachers teach subjects other than their minor qualifications acquired through in-service training.

These categories of reforms on the education system pivot the demand for teachers to cope with the necessary professional development for adamant transitions. An example of this is the implementation of the Kindergarten to Grade 12 (K-12) educational system, with demand for subject-specific teachers increased, particularly for senior high school. An example in a study by Barrot (2018) found that the new English curriculum in the K-12 curriculum misaligned with the traditional language teaching and learning principles, and highlights that the new curriculum needed “to improve its specificity, internal coherence, and integration of some essential principles of the 21st century” (Almerino et al. 2020). More recently, DepEd issued a guideline for the pilot implementation of the MATATAG Curriculum¹⁹ for SY 2024–2025 (DepEd Memorandum No. 54, s. 2023) affecting kindergarten, Grades 1, 4, and 7. Succeeding phases will be implemented in the next school years distributed across different grade levels, to address the misplaced prerequisite learning competencies in the current K-to-12 program (Estrellado 2023). Teacher preparedness is crucial, so sufficient training and professional development opportunities are necessary to supplement educators in adapting new pedagogical and instructional methods in order to meet the demands of the new curriculum (Baniqued and

¹⁹ The MATATAG Curriculum is the recalibrated basic education curriculum introduced by the Department of Education in the Philippines in 2023. Officially called the K to 10 Curriculum, it aims to strengthen foundational skills in literacy, numeracy, and socio-emotional learning while reducing the content load to focus on essential competencies. The curriculum emphasizes mastery of learning, relevance to real-life situations, and alignment with global standards. Source: Department of Education, Philippines

Bautista 2024). Meanwhile, DepEd's course of action for eligible K-12 senior high school teachers was to requalify teachers through LET, and in the process of retooling provide employment for displaced college teachers (Acosta and Acosta 2017).

Temporary or emergency mismatch. Mismatches also occur when teachers are asked to substitute for a subject area temporarily. In unavoidable situations or emergencies such as sudden staff changes or leaves of absence, lead to inadequate training or preparedness for instruction on either the subject content or teaching style adjustments (Timperley 2008). In the Philippines, natural disasters such as typhoons and earthquakes are common, and these events disrupt school operations and lead to emergency staffing adjustments. Frequent conflicts at the national level force a mismatching resolution to accommodate the continuity of education. Other countries like in Sri Lanka experienced emergency education that required some teachers were needed for the temporary learning centers to fill gaps in subjects where they have little to no training (Creed and Morpeth 2014).

Another cause for temporary mismatches is enrollment fluctuations. Demographic changes or economic factors can lead to these emergency mismatches like an unexpected decline in student enrollment in a particular subject may require schools to reassign teachers quickly, leading to assignments outside their areas of specialization (García and Weiss 2019).

Geographical mismatch. Teachers also experience mismatches outside of subject content and grade level, because another situation that misaligns their training is geographical school assignments. Rural and remote areas often suffer from a lack of resources, including access to well-trained subject specialists (Darling-Hammond 2010). Sutcher et al. (2019) explained that these high-minority and high-poverty schools are forced to assign teachers to subjects outside their expertise, since a shortage in hiring is caused by the challenge of attracting qualified educators with lower salaries and poorer working conditions. In addition, educational infrastructures are often disadvantaged in rural areas and are insufficient to support effective teaching. Teachers can be trained in technology education and can be assigned to rural schools that lack adequate technological resources. This is discussed in Monk (2007), where the study addresses how geographical factors contribute to teacher mismatch specific to rural and low-income areas, where teacher placement policies often overlook resource limitations.

Zamora and Dorado (2015) assessed the educational attainment in rural and urban areas in the Philippines, identifying gaps or education inequalities between the two settings. Their findings concluded that rural education attainment is still lagging behind, as it also continues to be a major education inequality experienced by most provinces. They also add that the gap in rural-urban educational attainment is very pronounced in the bottom ten provinces, mostly from the region of BARMM²⁰.

A more detailed discussion of the subcategories of geographical mismatches appears in localized studies and university publications, as shown below:

- i.) *Population differences.* Rural schools are in sparsely populated areas such as small towns or villages, while urban schools are in densely populated areas like large cities. Larger class sizes result in a greater number of students for each teacher to manage, that may lead to a reduced ability to provide individualized attention. A

²⁰ Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) is a region in the southern Philippines established under the Bangsamoro Organic Law (Republic Act No. 11054). It replaced the Autonomous Region in Muslim Mindanao (ARMM) and was formally inaugurated in 2019.

distinct characteristic of rural schools is their “small size, sparse settlement, narrowness of choice”, because of its economic foundation location-dependent industries can employ low-skilled workers—making it difficult to attract and retain high-quality teachers (Monk 2007). Guiaselon et al. (2023) reported that DepEd had made efforts to intervene with the class size and teacher-student ratio in public schools in the country, with the creation of non-teaching positions, which will ensure teachers will be able to focus more on their duties of teaching in classrooms and offload the administrative tasks to the support staff. However, the authors added that it was different for some urban centers and public high schools because of “overpopulation due to many contributory factors” (Mateo 2014, as cited in Hernando-Malipot 2018).

Arguably, a study by Bacolod and Tobias (2006) verified that similar to the result of previously studies on class size and student achievement, student-teacher ratios do not significantly impact school performance or school quality. On the other hand, Bray (2002) explains that teachers’ morale declines with the increase of class size, so student-teacher ratio should still be considered when reviewing teacher recruitment and deployment systems (Maligalig et al. 2010).

- ii.) *Cultural diversity and community immersion.* When teachers are unfamiliar with the local culture, they may fail to connect the learning material to students’ everyday experiences, which is an important pedagogical strategy, especially for subjects like social studies, literature, and history. Implications of mismatch and racial stereotypes in the classroom have been observed in previous research, such as strained interactions between students and teachers of different races (Carter 2003; Kao and Thompson 2003; Morris 2005; Nazaki 2000; Valdes 1996) and according to Leavell (2009) there are schools in the US where some first-year in-service teachers are not trained enough to teach in diverse classrooms; research has shown that racial diversity in schools and among teachers can be beneficial to students (Kayaand Aydin 2014; Martinez and Tadeu 2018; Wu and Ida 2018; Johnson and Hinton 2019; Carothers, Ayudin, and Houdyshell 2019).

Another challenge for out-of-field teachers is *language mismatch*, which is mostly encountered by elementary teachers who are required to teach subjects in rural communities that use a different mother tongue. In a study by Mangila (2019), the author observed the same issue in Subanen communities where students use the Subanen mother tongue but are taught in Bisaya—a different mother tongue language recognized by DepEd. This explains that despite the recent implementation of the use of mother tongues in school, the Philippine education system is unable to fully maximize a mother tongue-based multilingual education (Tupas 2015). Tyler (1949) noted that curriculums should be designed to match the perspective and experiences of the teachers using teaching instruction (Pacaña et al. 2019). Teachers assigned to classes with a wide range of abilities and prior knowledge may find it challenging to meet the needs of all students effectively. In the context of the Philippines, Pacaña et al. (2019) suggested that a sustainable culture-based pedagogy is necessary although out-of-field teachers are often obliged to to maintain their professional standing.

2.1.3. Theories and models explaining the significance of subject specialization in teaching

Several theories and models highlight the importance of subject specialization, explaining its impact on instructional effectiveness, student learning, and overall educational outcomes. These theories emphasize that teachers with subject expertise are better equipped to deliver content knowledge, employ effective pedagogical strategies, and foster deep student engagement. These theories and models also emphasize that teachers with expertise in a particular subject are better equipped to design effective lessons, manage student misconceptions, and adapt their teaching to meet the needs of diverse learners.

2.1.3.1. *Pedagogical Content Knowledge (PCK) Theory*. Introduced by Shulman (1986), which highlights the blend of content expertise and pedagogical skills that are critical for effective teaching. According to this theory, a teacher must not only know the subject matter but also understand how to teach it effectively to students with varying levels of understanding. Subject specialization enhances a teacher's ability to develop PCK, ensuring they can explain complex concepts, anticipate student misconceptions, and adapt instruction accordingly. Specialized teachers that have deeper PCK, can provide clearer explanations, design better assessments, and address student learning needs more effectively.

2.1.3.2. *Constructivist Learning Theory*. Suggests that learners construct knowledge through experiences, interactions, and hands-on activities. It can be explored in two theories. First is the Piagetian theory by Jean Piaget which is that our individual knowledge is like how children construct their own knowledge (Sjøberg 2010). This is because Piaget believed that children are active learners and that they learn gradually through interacting with their environment. Meanwhile, Lev Vygotsky constructivism or *social constructivism*, focuses more on collaborative learning in terms of interacting with others. Teachers with subject specialization are better equipped to create learning environments that facilitate active learning and inquiry. Specialized teachers can provide rich, subject-specific learning experiences, scaffolding students' understanding, and encouraging deeper engagement with the material. Specialized teachers can also better guide students through the process of knowledge construction in their subject areas, helping them develop critical thinking and problem-solving skills.

2.1.3.3. *Cognitive Load Theory*. Penned by Sweller (1988) suggesting that effective teaching minimizes unnecessary cognitive load on students, allowing them to focus on essential content. Teachers with subject expertise are more likely to organize and present information in ways that reduce cognitive overload, as they understand the structure and complexity of the material. Subject-specialized teachers can simplify complex ideas, present them in manageable chunks, and sequence learning in a way that facilitates comprehension. Specialized teachers can reduce students' cognitive load by presenting content in a clear, structured, and accessible manner, leading to better learning outcomes.

2.1.3.4. *Zone of Proximal Development (ZPD) and Scaffolding*. Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) explains that learners perform best when teachers provide appropriate support (scaffolding) just beyond the learner's current ability level. Teachers with subject specialization are better positioned to identify students' ZPD within their content area and provide the necessary scaffolding to advance learning. This includes using subject-specific teaching strategies that are tailored to students' needs.

Specialized teachers can offer targeted scaffolding that accelerates learning within the ZPD, helping students master difficult content more efficiently.

2.1.3.5. *Subject Matter Knowledge (SMK)*. Authors Ball, Thames, and Phelps (2008) wrote on Subject Matter Knowledge (SMK) which refers to the teacher's deep understanding of the facts, concepts, and procedures specific to a particular subject area. It includes not only knowing the content but also understanding how knowledge is generated, debated, and validated within a discipline. Research suggests that SMK is critical for developing high-quality instruction, as teachers who lack sufficient subject knowledge struggle to present content in meaningful ways. Teachers with strong SMK can anticipate student misconceptions, answer complex questions, and design more engaging, accurate, and relevant learning activities.

2.1.3.6. *Self-Efficacy Theory*. Investigates the individuals' belief in their ability to succeed affects their performance. Bandura (1977) stated that in teaching, teachers with higher self-efficacy are more confident, persistent, and likely to take risks in their instructional methods. Teachers with subject specialization are likely to have higher self-efficacy in their subject areas because of their deep understanding and comfort with the content, which translates to more effective teaching practices. Specialized teachers are likely to be more confident and innovative in their teaching, leading to improved student learning outcomes.

2.1.3.7. *Expertise Development Theory*. Lastly, the Expertise Development Theory, which posits that expertise in any field, including teaching, is developed through deliberate practice and deep engagement with specific content over time (Ericsson 1993). Teachers who specialize in a subject are more likely to have developed the expertise required to deliver high-quality instruction. They have spent more time honing their skills in specific content areas, which translates into better instructional practices and a deeper understanding of how to teach that content. Subject specialization leads to the development of teaching expertise, which is crucial for facilitating student learning and adapting instruction to meet diverse needs.

Previous theories and models highlight the critical importance of subject specialization in teaching and its influence on student learning outcomes. Nevertheless, mismatches in teacher assignments continue to pose substantial challenges within education systems globally. While there are well-documented advantages to aligning educators' expertise with their instructional roles, persistent issues such as teacher shortages, unequal distribution of qualified professionals, and systemic inefficiencies contribute to these mismatches.

2.2. *Issues and concerns with teacher-subject mismatch*

2.2.1. Prevalence and patterns of mismatch

The issue of OOF teaching has been documented in research around the world, with most studies conducted in the United States and with each study categorizing different forms of OOF teaching and producing results based on available data and information collected. Commonly reported is the prevalence of OOF in a particular type of school, school composition, year levels, subject area, and group of teachers.

In the US, OOF teaching is prevalent in small schools, in high-poverty schools, and in schools with students who are in low tracks as they are determined to be struggling students (Ingersoll 1999; Taylor et al. 2020; Van Overschelde and Piatt 2020). Localized studies such as Nixon et al.'s (2017) and Shepard et al.'s (2020) report the same observation in terms of high-need

schools having the most OOF teaching but reveal that it mostly occurs in urban schools or rural schools more than suburban schools. This latter finding is partly consistent in a larger dataset in the US where OOF teaching is reported not only in rural but also in charter schools (Van Overschelde and Piatt 2020) and in Western Australia where OOF teaching is reported in schools located in country areas than in the metro areas, but whether in the country or the metro, more OOF occurs in private schools such as Catholic and independent schools, than in government schools (McConney and Price 2009). Meanwhile, in Korea, more OOF teaching is reported in public schools than in private schools and in small schools (Kim 2011).

In high-poverty schools or schools located in communities with low socioeconomic status (SES) families, OOF teaching is reported at both elementary and secondary levels (Ingersoll 1999, 2002, 2008). In elementary school, most subject areas have OOF teachers. In social studies, for instance, around 30% of teachers in high-poverty schools do not have any academic preparation related to social studies compared to 16% in more affluent schools. In secondary, a third to over a half of teachers in math, physical sciences, and history either do not have a major or minor in the field they are teaching or is not certified to teach the subject they are handling, or both (Ingersoll 2002, 2008). Whichever level, schools with larger populations of ELL students, students receiving special education, and minority students including African-American and Latino students have more underqualified teachers (Ingersoll 2008; Nixon et al. 2017; Van Overschelde and Piatt 2020). For instance, in secondary schools, a third of math teachers are underqualified compared to 15.5% in schools with fewer minority students (Ingersoll 2008).

OOF teaching is in practice in all subject areas; however, there is more prevalence in science, math, and social studies, where there are a number of subdisciplines in each subject (e.g. physics, chemistry, biology in science). Ingersoll (2002) reports science to have the most OOF teaching as teachers in different disciplines account for large portions of OOF teaching including 20.3% of all science teachers, 33.1% of life science teachers, and 56.5% of physical science teachers. In the same study, math teachers are reported to have a third in their population to be underqualified. Longitudinal studies confirm that the OOF teachers in science and math are being consistent or increasing in number (Rushton et al. 2014, Shah et al. 2019). Meanwhile, this is also observed in other countries such as in Ireland where about a third of math teachers are underqualified (Cosgrove et al. 2004), in Australia where less than 40% are qualified to teach math and around half are qualified to teach science (Shah et al. 2020), and in Korea where 23% of teachers do not have in-field certificates (Kim 2011).

In terms of the profile of teachers who teach OOF, much of the research points to beginning teachers as the most likely population to be assigned outside their specialization (Ingersoll 1999, 2002; Nixon et al. 2017). In contrast are the OOF teachers in Australia who have around 20 years of teaching experience (McConney and Price 2009). Besides this, Van Overschelde and Piatt (2020) report that teachers who are male or Black or teaching at rural or charter schools or went through an alternative certification route are the ones who were engaged in more OOF teaching.

2.2.2. Challenges faced by mismatched teachers

Issues in the workplace exist in and out of the classroom from the conduct of lessons to engagement with other members of the school community. With the lack of subject knowledge, teachers not only find it challenging to deliver lessons but also to utilize the appropriate strategies that align with the students' age and grade level and that allow for proper

management of student behavior (Torcina and Villocino 2023). These similar concerns are raised by teachers in college handling general education courses. Bugwak (2021) listed additional challenges shared from participants, including difficulties in answering student questions and exercising authority in class given their lack of expertise in the courses they handle.

Given teachers' actions to compensate for the lack of content or pedagogical expertise, other difficulties surface. Their lack of confidence impacts their ability to learn through incidental learning. As they tend to prepare for their lessons by studying the content without full understanding of the concepts, learning beyond the intended materials becomes a daunting experience for them (Du Plessis et al. 2014). At the same time, in-service learning of content, especially in science, from references or resources cannot compensate for the preservice preparation provided by the appropriate university degree (Azri et al. 2008). All of these have implications on the quality of teaching and learning in the classroom and ultimately, on student outcomes.

Teachers report bearing expectations yet receiving little to no support (Du Plessis 2014). Additional time needed for planning and preparation is necessary; however, no allotment for this is provided (Du Plessis 2015). Du Plessis (2014) noted the non-existence of dialogues between teachers and school leaders which may have led the latter to believe the former's dependence on colleagues and constant requests for assistance.

2.2.3. Impact on teacher morale and professional satisfaction

Stemming from a lack of knowledge base, teachers report feelings of insecurity, inadequacy, and stress and negative impacts on their self-esteem and perceptions about themselves and their role as teachers, sharing that they do not feel good enough (Du Plessis et al. 2014; Steyn and 2014). In addition, teachers do not feel respected nor valued for they feel that their concerns are not fully understood, and their needs are not addressed (Du Plessis et al. 2014). They feel that they are left to resolve difficulties on their own and feel detached and neglected by the school community (Steyn and du Plessis 2014). However, not only do they feel distant from school leaders, their colleagues, and parents, for they become detached from their students as well. Steyn and du Plessis (2007) reported, "as part of the attempt to protect their professional image, teachers keep an unnatural distance from the learners (p. 151)."

Teachers also share that they feel losing control of themselves as a result of their situation, and their dissatisfaction and disappointment in their profession have led them to consider leaving teaching and pursue something beyond a school career (Steyn and du Plessis 2014). Given this, they also have concerns on negative job prospects as a result of their teacher ratings that may be linked to student performance from standardized tests (Du Plessis 2015). With these, McConney and Price (2009) noted that there is still little research on the effects of OOF teaching on teacher burnout or attrition.

2.2.4. Student perception of mismatched teaching

Sensory and behavioral inputs from students play a significant role in better understanding the immediate effects of mismatched teaching, as it highlights how students react to varying instructional methods that may not align with their learning styles or cognitive preferences. Peacock (2001) cited several studies on the importance of matching teaching styles with students' preferred learning styles, particularly in the context of English as a Foreign Language

(EFL) education. His study, based on Reid's (1987) hypothesis, suggested that a mismatch between teaching and learning styles often leads to frustration, demotivation, and even failure in learning. Similar research in South Korea also found out that while teachers favored communicative teaching approaches, students preferred more traditional, grammar-focused methods (Lee and Choi 2019). This disconnect reflects the broader challenge of transitioning from grammar-oriented instruction to communicative language teaching (CLT), as it carries some weight on the part of the student, especially those who are expected to take up national-level admission tests to universities like the College Scholastic Ability Test (Korea), Cambridge General Certificate of Education (Singapore), or Special Tertiary Admissions Test (Australia).

The Raising Achievement through Formative Assessment in Science and Mathematics Education (FaSMEd) team at the Newcastle University in United Kingdom discussed how an experienced mathematics teacher faced significant challenges when introducing algebraic expressions to her Year 9 students due to the students' limited prior knowledge of algebraic manipulation, which greatly hindered their ability to grasp the core concepts. This is a common issue where a gap between what the teacher assumes as prior knowledge and what the students understand becomes evident, leading to disengagement and confusion. Despite the teacher's best efforts to use technology and interactive whiteboards to visualize and assess student responses in real-time, the mismatch between the complexity of the tasks and the students' readiness for them became a barrier to effective learning (FaSMED n.d.). In the case of science teachers, Fitzgerald, Danaia, and McKinnon (2020) explored similar issues within high school science classrooms, where differences in perception between students and teachers about the nature of classroom activities often lead to discrepancies in how learning experiences are viewed and interpreted.

2.3. Policies pertaining to teacher-subject matching (DepEd)

2.3.1. National and regional policies

DepEd has long recognized the importance of aligning teacher qualifications with teaching assignments to improve instructional quality and learning outcomes. DO No. 13, s. 1994, institutionalized teacher–subject matching by mandating that teachers be assigned to subjects consistent with their academic preparation and professional training (Bugwak, 2021). The policy stipulates that individuals holding a Bachelor of Secondary Education degree, or an equivalent qualification with specialization in a major subject area, are considered qualified to teach all subjects within that field. This framework sought to professionalize teacher deployment and ensure that instructional quality is supported by adequate subject matter expertise.

Despite the policy's intent, empirical studies indicate persistent challenges in implementation. Research shows that teacher–subject mismatch remains prevalent, particularly in rural and underserved regions, where shortages of qualified educators compel administrators to assign teachers to subjects beyond their specializations (Bayani & Guhao, 2017; Bugwak, 2021). Such mismatches have been found to negatively affect instructional quality, as teachers lacking sufficient content knowledge often struggle to engage students effectively or to adapt pedagogy to complex subject demands (Salleh, 2013). Consequently, while DepEd's policy framework provides a formal mechanism for teacher assignment, its practical efficacy is hindered by systemic limitations such as staffing imbalances, limited professional development opportunities, and inequitable teacher distribution (Bugwak, 2021). Addressing these structural

constraints remains critical for realising the goals of teacher–subject alignment and improving overall educational quality.

2.3.2. Policy Review

While DepEd’s teacher assignment policy provides a regulatory foundation, several policy gaps continue to impede its full implementation and impact.

2.3.2.1. *Discrepancy between qualifications and assignments.* A significant concern highlighted in the literature is the mismatch between teachers’ qualifications and their assigned teaching loads. Studies reveal that due to shortages of qualified applicants particularly in remote or geographically isolated areas, teachers are often compelled to handle subjects outside their specialization (Abas & Marasigan, 2020; Bongala et al., 2020; Bugwak, 2021). This systemic discrepancy perpetuates inequities in education quality, as students in these contexts are less likely to receive instruction from subject-competent teachers. .

2.3.2.2. *Insufficient data on out-of-field teaching.* Ingersoll and Collins (2018) argue that the lack of comprehensive data on out-of-field teaching hinders evidence-based policymaking. Without reliable and disaggregated statistics, policymakers struggle to quantify the extent of teacher misassignment and to develop targeted interventions. This data gap limits the ability to assess how out-of-field teaching influences student performance and teacher efficacy, thereby constraining reform efforts aimed at addressing root causes.

2.3.2.3. *Inadequate support systems.* Another recurring theme in literature concerns the limited institutional support available to teachers handling unfamiliar subjects. Professional development programs often fail to provide the specialized content training necessary for out-of-field teachers to build competence and confidence (Salleh, 2013). The absence of structured mentorship or continuous professional learning exacerbates teachers’ difficulties, potentially leading to lower morale and reduced classroom effectiveness.

2.3.2.4. *Hiring practices and teacher demands.* The hiring practices in many schools are shaped by systemic pressures and administrative constraints. As noted by Salleh (2013), vacancies are frequently prioritized over proper qualification matching, resulting in teachers being assigned to subjects for which they lack formal preparation. Administrative urgency to fill teaching posts particularly under union or local government pressure, can further entrench these mismatches and weaken long-term capacity-building strategies.

2.3.2.5. *Lack of accountability mechanisms.* A further weakness of the current policy framework lies in the absence of robust accountability mechanisms to ensure compliance with teacher–subject matching standards. Bugwak (2021) contends that without consistent monitoring and enforcement procedures, schools may continue assigning teachers outside their qualifications without repercussion. This lack of institutional accountability perpetuates policy non-compliance and undermines the system’s efforts to maintain educational standards.

2.3.3. Certification and qualification standards

DepEd’s certification and qualification standards are designed to guarantee that teachers possess the requisite knowledge and competencies in their teaching areas. However, studies suggest that these standards are not always supported by sufficient professional development

structures (Bugwak, 2021; Bayani & Guhao, 2017). Many teachers, particularly those assigned out-of-field, have limited access to retraining or skills enhancement programs that could improve their pedagogical and content expertise. Furthermore, Weldon (2016) highlights that even teachers with formal qualifications may lack the practical experience necessary to deliver effective instruction, suggesting that certification alone is insufficient without continuous capacity building.

2.3.4. Role of school administration in teacher assignments

School administrators play a pivotal role in operationalizing teacher–subject matching policies. However, their decision-making is often constrained by policy rigidity, limited staffing, and resource shortages. Bugwak (2021) notes that administrators frequently justify assigning out-of-field teachers based on the belief that competence can be developed through subsequent training, though this may compromise students’ immediate learning needs. Similarly, Weldon (2016) argues that while experience can enhance teaching proficiency over time, the absence of immediate subject expertise often results in suboptimal instruction. Administrators thus navigate a complex balancing act between adhering to policy directives and meeting urgent staffing demands, underscoring the need for more flexible yet accountable teacher deployment systems.

2.4. *Effect of teacher-subject mismatch on academic achievement of students*

2.4.1. Impact on student learning outcomes

This mismatch can have adverse effects on the quality of education received by students. Because of this, studies on mismatch have been gaining popularity in literature on education. Some earlier studies are Kagan (1965) and Henson and Borthwick (1984), then later more empirical research from Lange (1973), Tines (1974), Spindell (1976), Packer and Bain (1978), and Saracho (1978) (Zhang 2006). The issue of mismatch appears to be an enduring challenge rather than a recent development, suggesting that it has been present and overlooked for an extended period. This long-standing nature of the problem highlights its urgency, as delaying its resolution further could exacerbate its negative impact on education, workforce alignment, and overall societal progress. Addressing this critical concern is essential to ensure that systems adapt to evolving demands and provide equitable opportunities for all stakeholders

2.4.2. Classroom dynamics and student engagement

Teacher-subject mismatches can disrupt classroom dynamics by reducing the confidence levels of teachers, as well as their teaching quality and instructional delivery. Jenkins (2017) for example, identified that teachers assigned to subjects outside their expertise often experience a lack of agency, which negatively impacts their ability to effectively engage with their students and deliver the curriculum as intended. Students can also quickly sense when a teacher is uncomfortable or unqualified to teach a subject. For instance, Lau et al (2021) discovered that teacher confidence plays a crucial role in alleviating student’s anxiety levels. This is aside from their intrusive thoughts and feelings of apprehension during tasks requiring mathematical reasoning. When a teacher lacks deep knowledge of the subject, lessons may become overly simplistic, repetitive, or less engaging (Feiman-Nemser, McDiarmid, Melnick, and Parker 1989).

2.4.3. Longitudinal effects on student learning

Lee and Lee (2020) discovered that sustained exposure to mismatched teaching methods can have adverse effects on students' educational attainment, leading to lower academic achievement over time. Their research also highlighted that even subtle, ongoing mismatches in mathematics and science can compound over the years, ultimately affecting the students' confidence, engagement, and future choices. Monk (2007) on the other hand, analyzed how the subject matter preparation of secondary mathematics and science teachers impacts student achievement in the long run. He found that teachers with stronger content knowledge contributed significantly to higher-level courses.

Student learning can also be associated with other societal issues, such as security and public order. According to Rose, Schellenberg, and Shem-Tov (2022), teacher quality has long-term impacts on students' life outcomes, especially their interactions with the criminal justice system. Their findings suggest that teachers who foster positive behaviors, reduce class suspensions, and encourage regular attendance contribute more substantially to the students' future success.

While there has been proof of a strong association between subject-matter preparation and student performance, policymakers must take this with a grain of salt, as the impact of teacher quality extends beyond traditional metrics like test scores. Byrne (1983) in Laczko-Kerr and Berliner (2002) for example, have found that a significant number of studies on the topical matter that he reviewed found no direct relationship exists between the two variables.

2.4.4. Comparisons between matched and mismatched teaching

Some studies have also examined direct comparisons of the learning outcomes of students taught by teachers whose specializations match or do not match the subjects they teach. Previous research indicates that students taught by teachers certified in their subject areas achieve higher test scores in mathematics and social studies (Dee & Cohodes 2008). In low-income school districts, students taught by certified teachers also demonstrate better academic performance (Laczko-Kerr & Berliner 2002). Among various types of weak teaching credentials, three have the most significant negative effects on student outcomes: entering the profession through lateral entry, holding a certification in a subject different from the one taught, and lacking teaching experience (Clotfelter et al. 2007).

2.5. *Interventions in addressing teacher-subject mismatch*

The impact of teacher-subject mismatch on students' academic achievement underscores the urgent need for policy revision and reformulation aimed at improving learning outcomes. Addressing this challenge necessitates multifaceted approaches, including professional development programs that equip teachers with the necessary skills and knowledge, mentoring systems to provide ongoing guidance and support, and instructional interventions to ensure the strategic deployment of teachers in alignment with their areas of expertise. Each of these strategies plays a crucial role in mitigating the adverse effects of mismatched teaching assignments. These can only be done through policy revision and reformulation. The following sections present a review of studies that explore these interventions, shedding light on their effectiveness, efficiency, and implications for practice and policy.

2.5.1. Professional development and training programs

Professional development and training programs are essential in tackling the problem of out-of-field teaching by providing teachers with the essential skills and knowledge to teach topics that are not their primary area of expertise. Upskilling teachers' capabilities was shown to have a favorable influence on resolving challenges with out-of-field teaching. Programs like the Professional Diploma in Mathematics for Teaching in Ireland have been shown to lessen the frequency of out-of-field teaching by equipping teachers with the appropriate credentials and confidence to teach topics like mathematics properly (Goos et al. 2020, 2023). Another approach is to improve teaching practice. These initiatives frequently emphasize enhancing teachers' understanding of pedagogical content knowledge and their teaching practices. For example, teachers indicated transitioning from traditional methods to more learner-focused strategies after their involvement in specialized pedagogy workshops (O'Meara and Faulkner 2022).

Furthermore, professional development training enhances teachers' confidence and competence. Professional development initiatives enhance educators' self-efficacy and confidence in teaching new subjects outside their majors, and these programs result in gaining confidence after a relational grasp of material, pedagogy, and curriculum (Donitsa-Schmidt et al. 2021; Kenny et al. 2020). To ensure that out-of-field teachers benefit from professional development, aligning their needs with the designed learning experiences is crucial. This alignment is essential for fostering sustained learning and ensuring the knowledge gained can be effectively applied in their classrooms (Kenny et al. 2020).

2.5.2. Mentoring and peer support

Mentoring and peer support are vital in tackling the challenge of out-of-field teaching in basic education, offering necessary assistance and opportunities for educators to grow professionally. Research has demonstrated that peer mentoring models effectively improve the psychosocial support that preservice teachers receive during their practicum. This support is crucial in boosting their confidence and readiness to tackle teaching difficulties, particularly those associated with teaching subjects outside their area of expertise (Nguyen 2013). Mentoring programs, particularly school-based ones, improve professional growth. They educate instructors to teach beyond their specialty and build resilience. Mentoring also helps include special needs students in inclusive education (Bērziņa 2011).

Peer mentorship encourages teachers to exchange techniques and experiences. This collaborative approach helps teachers gain fresh perspectives and develop existing methods when teaching unfamiliar topics (Vaughan et al. 2016; Burger et al., 2023). Organized peer mentoring programs, such as Near-Peer Mentoring (NPM), may effectively mitigate the stress involved with teaching outside of one's profession by offering a support network. The initiatives augment instructors' feelings of belonging and self-assurance in their pedagogical skills (Chandrasekera et al. 2024). Collaborative teaching and peer observation provide teachers with timely feedback and actionable insights, which are crucial for enhancing the quality of instruction in situations where they may be teaching outside their primary area of expertise (Ahmad 2023).

2.5.3. Policy and administrative interventions

Numerous studies have highlighted various policy and administrative interventions to tackle the challenge of out-of-field teaching. Implementing focused professional development initiatives, like the Professional Diploma in Mathematics for Teaching in Ireland, has reduced out-of-field teaching and enhanced teaching practices (Goos et al. 2023). Policies must facilitate diverse professional learning opportunities specifically designed to meet the needs of teachers working outside their primary fields, especially in STEM areas (Vale and Drake 2019). Making micro-education policies can offer focused assistance to teachers out of their field, tackling the unique challenges they encounter in their teaching settings (Du Plessis 2020; Du Plessis and McDonagh 2021).

Effective leadership requires a deep comprehension of the intricacies surrounding out-of-field teaching, alongside the implementation of essential support systems to enhance teacher well-being and foster a strong professional identity (Hobbs 2013; Du Plessis 2015). Teacher retention and attrition must be addressed. This requires identifying out-of-field teaching as a systemic problem and establishing long-term initiatives to consistently supply expert teachers (Vale and Drake 2019; Vale et al. 2022). Improving initial teacher training to more effectively equip future educators for varied and intricate school environments can help address the difficulties linked to out-of-field teaching (Du Plessis 2020).

2.5.4. Success stories and case studies

Porsch and Hobbs (2024) examined principal attitudes in Australia and Germany revealing that principal has different attitudes concerning the varying opinions on the significance of the teacher's content knowledge, the impact on the quality of teaching, and the professional development as the assistance they extend to out-of-field teachers. An analysis of secondary data using the Program for International Student Assessment (PISA) in 18 countries revealed that specialized science educators correlate with enhanced scientific literacy and greater student enjoyment. Moreover, the findings indicate that specialized science teachers play a vital role in enhancing students' scientific literacy skills and fostering their enjoyment of learning (Hanfstingl et al. 2024). In Australia, preservice teachers were aware of the reality and the effect of out-of-field teaching, making future teachers feel stress before entering the profession (Wheeley et al. 2023). In New Zealand, out-of-field teachers teaching in Mandarin reveal that the teachers' perception of themselves shaped their identity (Biebricher 2023).

Australia has established professional development initiatives to assist these educators. These programs particularly target the enhancement of teachers' skills in certain fields, which has shown the potential to enhance the quality of teaching and the academic achievements of students (Price et al. 2019; Hobbs and Quinn 2021). Structured professional development models for out-of-field teachers have been implemented in both Ireland and England. These approaches prioritize ongoing learning and assistance, enabling teachers to acquire the essential material and pedagogical expertise to teach proficiently in areas other than their specialization (Faulkner et al. 2019). The prevalence of out-of-field teaching in South Africa may be attributed to the current shortage of teachers. However, the provision of professional development and leadership support has played a vital role in facilitating the adaptation and success of teachers in these positions. The use of this strategy has resulted in enhanced teacher confidence and efficacy (Du Plessis et al. 2014, 2017).

2.6. Synthesis of the review of related literature and studies

Table 1 outlines specific gaps in the reviewed literature, particularly those closely linked to research objectives 2 through 4.

For **Objective 2**, understanding the extent of teachers’ specialization and the prevalence of subject-taught mismatches across key stages of basic education—elementary, junior high, and senior high school—remains a significant research need. While subject mismatch is commonly defined as teaching a subject outside one’s area of expertise, Literature on the subject remains scant. There is limited insight into the number of subjects taught by teachers that are misaligned with their formal training or perceived area of preparation.

For **Objective 3**, although standardized tests are commonly used to measure learning outcomes equitably and assess the impact of subject-taught mismatches, context-based assessments—such as teacher-designed quarterly exams—offer an additional layer of understanding. These assessments can provide a nuanced perspective on how mismatches influence learning outcomes within specific educational settings. However, the role of such assessments in evaluating the effects of teaching mismatches has received little attention in the reviewed literature.

For **Objective 4**, while the effects of subject-specialization mismatches on teaching assignments are well-documented, the lived experiences of teachers navigating these mismatches remain underexplored. These firsthand accounts are essential for understanding the context-specific challenges educators face and the complex realities of mismatched assignments. Addressing this gap is particularly important for developing policy recommendations that mitigate the adverse effects of out-of-field teaching.

These identified gaps highlight areas where current research is insufficient, offering a clear path for further investigation. By addressing these issues, this study seeks to provide valuable insights and contribute to bridging critical knowledge deficits in the field, with a specific focus on informing policy recommendations related to out-of-field teaching (Objective 4).

Table 1. Research gaps on teacher-subject mismatch

Research objectives	Topical areas	Research gap
Extent of teacher’s specialization and subject-taught mismatch	Discrepancy between Qualifications and Assignments (Bongala et al. 2020; Abas and Marasigan 2020)	The prevalence and severity of subject-taught mismatches across basic education levels remain under explored, with limited research on the extent to which teachers teach subjects misaligned with their training or expertise.
	Types of Mismatch (Timperley 2008; Kim 2011; Acosta and Acosta 2017; Darling-Hammond, and Carver-Thomas 2019)	
	Hiring Practices and Teacher Demands	

Correlation between teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their quarter exam scores

Impact on Student Learning Outcomes

Quantitative outcomes (e.g., low test scores)
Costa et al. 2020; Sheppard et al. 2020; Taylor et al. 2020; Van Overschelde 2022

Qualitative outcomes (e.g., low confidence, motivation, and engagement)
Lee and Lee 2020; Lau et al. 2021; Rose et al. 2022

Standardized tests measure learning outcomes equitably, but context-based assessments, like teacher-designed exams, offer deeper insights into the impact of teaching mismatches. However, their role remains largely unexplored in literature.

Teachers' insights about the importance of their specialization and the actual subjects taught in relation to their students' learning outcomes

Simplistic or repetitive lessons
Bugwak 2021; Lau et al. 2021; Torcina and Villocino 2023

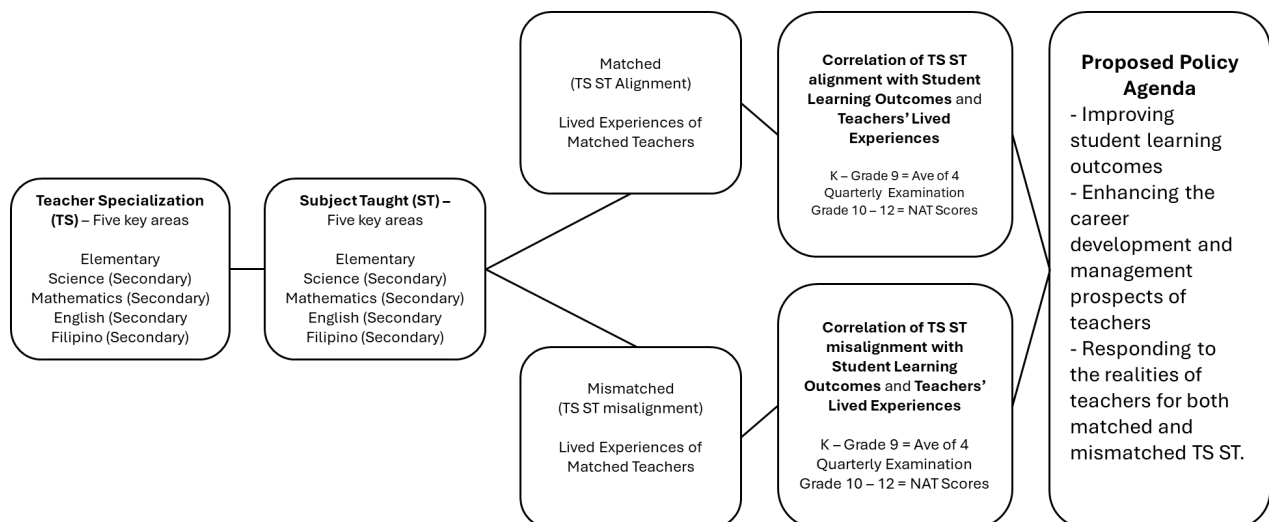
Subject-specialization mismatches in teaching are well-documented, but teachers' lived/narrative experiences with this issue remain underexplored. Understanding these firsthand accounts is vital for capturing context-specific challenges and informing policies to address the negative impacts of such mismatches.

Source: Authors' construction.

3. Methodology

3.1. Conceptual framework

Figure 1. Conceptual framework of the study



Source: Authors' construction.

To explore how the alignment of teacher specialization and the subjects taught impacts students' learning outcomes, the study is guided by the conceptual framework as shown in Figure 1, and it is described below.

In this figure:

- a. The first and second boxes reflect the context of this study, that is, teachers' specialization and corresponding teaching assignment. The study will focus on the five key areas/specializations namely, (1) Elementary, (2) Science - secondary, (3) Mathematics - secondary, (4) English - secondary, and (5) Filipino – secondary (CHED Order No. 74 and 75, s. 2017²¹).
- b. The context is described into two realities at the school level, one where the teacher handles a subject that matches the academic profile while the other scenario is a mismatch between these two variables. The matching (teacher specialization [TS] and subject-taught [ST] alignment) and mismatching (TS and ST misalignment) will be examined based on the student learning outcomes (Zhang 2006; Hwang et al. 2021).
- c. Student learning outcomes represented by their first quarter examination scores will be correlated with TS and ST alignment and misalignment of the teacher participants. First quarter exam scores were collected as key indicators of student performance to measure learning outcomes for both matched and mismatched TS and ST for teacher participants. The quarterly exams, despite being prepared by different divisions, evaluate the same competencies outlined in the DepEd curriculum, making them appropriate for comparative analysis. The research team acknowledges the potential limitations this may pose and will account for these in the analysis to ensure the validity of the findings.
- d. The findings of this study will form the foundation for policy agenda/recommendations that, if effectively monitored and evaluated, are anticipated to impact learning outcomes. The targets for the policy agenda are: (1) improving student learning outcomes, (2) enhancing the professional development and management prospects of teachers, and (3) responding to the realities of teachers for both matched and mismatched TS and ST (Wheeley et al. 2023).
- e. Additional qualitative factors related to learning outcomes gathered through qualitative data collection will also be included.

3.2. Research design

Explanatory sequential mixed-methods research (MMR) design (Creswell and Plano Clark 2018) was employed for this study following the objectives of integrating quantitative and qualitative data. This approach was deemed appropriate as the results from the quantitative phase informed the selection of participants for the qualitative phase, while the findings from the qualitative phase provided deeper insights into the quantitative results.

The quantitative phase answered the question on the extent of teacher's specialization and subject taught mismatch and their influence on student's learning outcomes while the qualitative phase gathered stories from the teachers as to the reasons behind this mismatch and the possible policy recommendations to put forward.

²¹ Policies, Standards, and Guidelines for Bachelor of Elementary and Secondary Education.

For the quantitative phase, descriptive correlational research was used. Descriptive correlational research aims to describe the variables and determine the relationship between and among them without influencing them (Fraenkel et al. 2023). The design was employed to determine the extent of mismatches in teacher qualifications and subject assignments and their relationship with student learning outcomes at both elementary and secondary education levels. Following the quantitative phase, the qualitative phase commenced with key informant interviews (KIIs) and focused group discussions (FGDs) to further explore and validate the quantitative findings. The design in the qualitative phase was descriptive qualitative or basic qualitative design.

3.2.1. Existing dataset review

The secondary data used were the first quarter examination scores of the students of the teacher participants.

Table 2. List of secondary data

Data	Source	Remarks
First quarter examination scores measuring the competencies found in the DepEd Curriculum	Class record of teacher-participants	Requested from the teacher

Source: Author’s construction.

3.2.2. Data collection methods

The primary data collection employed was the survey of the teachers’ personal and professional profile using a researcher-made instrument. The instrument was reviewed and validated by the members of the research team to ensure the alignment of the items with the objectives of the study. The personal profile covered their sex, age, and region of origin. The professional profile covered their undergraduate major, highest educational attainment, grade level(s) taught, subject(s) handled, number of years in the service, and whether they have other teaching certifications related to the subjects they handle.

For the quantitative phase, the following are the details of the data collection procedures.

3.2.2.1. Sampling criteria. It is important to note that mismatches vary between the two educational levels. In elementary education, no specific specialization is required for teacher preparation. A Bachelor of Elementary Education (BEEd) degree, with or without any major or specialization, is considered adequate for teaching all subjects across all grades in elementary schools. Conversely, at the secondary level, there are eight major areas of specialization. According to DO No. 13, s. 1993, when hiring teachers and assigning them to subjects, preference is given to those who majored in specific subjects during their pre-service education.

Therefore, a mismatch at the elementary level would involve teachers who have a degree in secondary education but are teaching at the elementary level. While at the secondary level, a mismatch refers to teachers teaching subjects that do not align with their major or subject specialization during pre-service education.

Based on the data publicly available from the DepEd, there are 514,099 elementary teachers and 288,687 secondary teachers as of 2021 (DepEd 2021). Considering constraints related to budget and time, employing random sampling to achieve a 10 percent sample size from each level is not feasible, especially given that the sampling frame also requires updating. Therefore, this utilized a purposive sampling method. Despite being purposive, this approach ensures representation from both the elementary and secondary levels.

Originally, the target sample size at the elementary level was five teachers from each region in Luzon, Visayas, and Mindanao, totaling 85 teachers. At the secondary level, the target sample comprised teachers currently assigned to teach the subjects assessed in the 2024 National Achievement Test (NAT), specifically Science, Mathematics, English, and Filipino. A minimum of four teachers per subject was to be invited from each of the 17 regions, for an overall total of 357 teachers.

However, during data collection, this study encountered challenges in meeting the target sample sizes for each grade level and subject area. These difficulties primarily arose from the lack of access to data on teachers' teaching subjects outside their specialization due to data privacy concerns.

To address this issue, the researchers relied on their networks of teachers and principals and utilized social media publications to recruit participants. 245 teachers instead of the targeted 357 were surveyed²². Table 3 provides a breakdown of these participants according to the grade levels they taught.

Another challenge encountered during data collection involved obtaining student outcome data for the teachers included in the study. The initial plan was to use the NAT scores for this purpose. However, many teachers had not received copies of their students' NAT results. As a result, the researchers opted to use the students' first-quarter exam results instead.

Unfortunately, the first-quarter exam data provided by the participants presented additional issues. Some scores were not expressed as averages, others were reported only as score ranges, and some participants refused to provide the necessary data. Ultimately, of the 245 teachers surveyed, only 39 teachers were identified as having clearly defined scores suitable for correlation analysis. While relatively small, this sample size was sufficient for conducting a point biserial analysis.

²² PISA and TIMSS data, while valuable, presents significant challenges due to the lack of a direct one-to-one correspondence between teachers and their students in this study.

Table 3. Distribution of participants according to the grade level they handle

Education Level	<i>n</i>
Preschool & Elementary	81
Junior High School	94
Senior High School	53
Both Elementary & Junior High School	6
Both Junior & Senior High School	11
Overall total	245

Source: Author’s compilation from teacher survey responses.

For the qualitative phase, various teacher participants were invited to join the FGDs and KIIs to share insights on the importance of teacher specialization and subject-taught alignment in ensuring student outcomes. Selected educational administrators were also invited to participate in the scheduled FGDs and/or KIIs to validate the inputs of the teacher participants for both matched and mismatched teacher specialization and subject taught. Moreover, this qualitative phase addresses the identified research gaps in Table 1, where teachers’ lived experiences and narratives with this issue remain underexplored. Understanding these firsthand accounts is vital for capturing context-specific challenges and informing policies to address the negative impacts of such mismatches

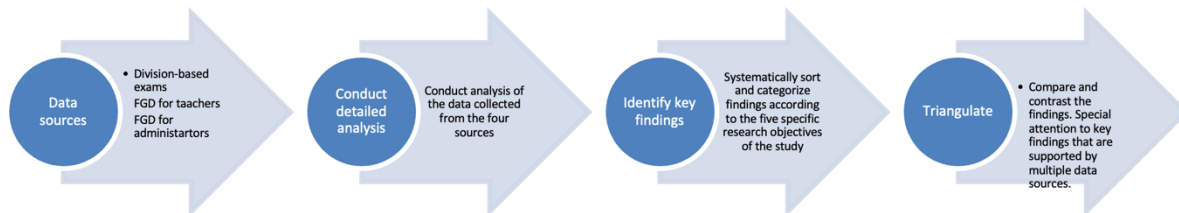
Table 4. List of qualitative methods

Method	Focus Area/Topic	Respondent	Justification
FGDs/KIIs	Teacher Specialization Issues and Concerns	DepEd teachers	To get varying perspectives on the school-level about the issues and concerns of teachers with regard to specialization, teaching performance and learning outcomes. To examine how important teaching specialization and subject-taught alignment is in ensuring student outcomes.

A 1.5-hour FGD was conducted via Zoom using a set of contextual questions. Participants were guided to respond based on their lived experiences as elementary or secondary teachers (see Appendix B for the KII/FGD semi-structured questionnaire). To ensure comprehensive representation, the researchers conducted nine FGD sessions, each accommodating up to seventeen participants. One teacher from each region was invited to represent elementary, secondary science, secondary mathematics, secondary English, and secondary Filipino teachers. The key FGD questions were displayed on the screen to facilitate discussion, and research assistants (RAs) assisted in collecting participants' responses. All responses were recorded, transcribed, and analyzed using thematic analysis.

Figure 2 illustrates the triangulation process implemented in this study. Data were collected from four primary sources: NAT, division-based examinations, FGDs, and the Student Outcome Perception Interview (SOPI). A comprehensive analysis was performed on each dataset to ensure an in-depth examination of the information to provide a well-rounded understanding of the results.

Figure 2. Data triangulation



Source: Authors' construction.

The key findings were systematically organized by sorting and classifying them according to the five specific research objectives outlined in the study. This step involved carefully reviewing each result, aligning data points with the appropriate objectives, and grouping the findings accordingly to facilitate focused analysis.

In the final phase, triangulation, the findings were compared across all data sources for each research objective. This comparative analysis highlighted both similarities and differences in the results, identifying any patterns or discrepancies that emerged. Special attention was given to key findings that are supported by more than one data source, as these provide stronger evidence and validation. Any conflicting data were examined closely to explore their potential implications and to consider alternative interpretations.

The data analysis for the quantitative phase included descriptive statistics such as frequency and percentage to describe the participants in terms of their personal and professional profile and the extent of their undergraduate specialization and subject taught mismatch. In addition, a point-biserial correlation was employed to assess the relationship between the match or mismatch of the participants' undergraduate specialization and subject(s) taught and their students' learning outcomes represented by their first quarter examination scores.

A researcher-made survey instrument (see Appendix B) focusing on the personal and professional profiles of teachers was utilized. This survey was administered to the participants immediately after they provided their consent. Meanwhile, a separate FGD and KII were

conducted after analyzing the survey data among the selected participants. A protocol for the FGD and KII was developed and implemented to facilitate the collection of qualitative data. A comprehensive review and evaluation of the gathered quantitative and qualitative data were conducted to address the research questions. Qualitative data were transcribed and coded, while quantitative data were organized and analyzed using frequency, percentage, and point biserial correlation in Jamovi software. Table 5 presents the mapping of study objectives and the corresponding data and analyses.

Table 5. Mapping of study objectives and the corresponding data and analyses

Item	Specific Objective	Data Items	Data Analysis
1	To describe the teachers in terms of their personal and professional profiles related to their specialization and subject(s) taught.	Data on the personal and professional profile of the participants	Frequency and percentage
2	To analyze the extent of teacher's specialization and subject-taught mismatch.	Data on the number of teachers' according to their undergraduate specialization and the subjects they handle	Frequency and percentage
3	To examine the correlation between teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their first quarter examination scores	Coding of the match (1) or mismatch (0) of teacher specialization and subject taught and first quarter examination scores of their students	Point biserial correlation
4	To explore teachers' insights about the importance of their specialization and the actual subject(s) taught in relation to their students' learning outcomes.	Transcribed FGD for Teachers and School Administrators	Thematic Analysis FGD transcripts, KII transcripts
5	To provide policy recommendations in terms of teacher recruitment and inputs to possible training programs that may be conducted to improve teacher effectiveness and student learning outcomes.	Relevant secondary reports and documents from DepEd and scholarly sources; FGD and KII Transcripts and Quantitative results	Thematic analysis of secondary reports and scholarly documents, FGD transcripts, KII transcripts

Source: Authors' construction.

3.2.3. Ethical Considerations

No major ethical issues arise because the research does not pose significant dangers to participants. Some of the data used was publicly available school management data. The confidentiality agreements were given before KIIs and FGDs to give participants an opportunity to ask questions about the study and their rights. Confidentiality and anonymization were observed throughout the study phases. The team gathered quotes and inputs to generate confidential outputs. The study team protected populations in research distribution plans if discovered information was hazardous. The team stressed respondent safety and utmost confidentiality.

4. Results and Discussion

4.1. Professional profiles of teachers related to their specialization and subject(s) taught

4.1.1. Distribution of respondents

A total of 245 teachers participated in the online survey. About 45 percent of respondents (44.90% or 110) came from Batch 1, while the remaining 55 percent (55.20% or 135) came from Batch 2.

4.1.2. Age

The mean age of respondents is 37.96 \pm 9.46. The youngest respondents are in their twenties, while the oldest are in their sixties. While it is seen that most of the respondents are in their early to middle adulthood, age is not a significant contributing factor in teaching competence and performance (Pranoto et al. 2021; Asis et al. 2023; Hasanodin and Arazo 2024; Canuto et al. 2024).

4.1.3. Sex

Over 70 percent of respondents are female (71.02% or 174), while less than 30 percent are male (28.98% or 71). The teaching profession is predominantly female in public schools. Female teachers are significantly higher in general teaching competency than male teachers (Maji 2024) because men tend to place stronger emphasis on academic and theoretical knowledge, while women are more inclined toward understanding students' personal concerns and promoting equal opportunities (Kovacs 2019) and have positive attitudes towards teaching (Alnahdi and Schwab 2023).

4.1.4. Highest educational attainment

Nearly 50 percent (49.80% or 122) of the teacher respondents hold undergraduate or bachelor's degrees, while almost 40 percent (40.82% or 100) have master's degrees. Less than 10 percent (9.38% or 23) hold doctorate degrees. This indicates that half of the respondents meet the minimum educational qualification to teach with only a bachelor's degree, while the other half possess additional qualifications, such as master's or doctorate degrees. Studies have shown that educational attainment, particularly in the form of professional development, predicts teachers' teaching performance (Galiza et al. 2018; Ningtiyas 2018; Canuto et al.

2024). A lack of updated subject knowledge makes it difficult for teachers not only to deliver lessons effectively but also to employ appropriate strategies that align with students' age and grade level while ensuring proper classroom management (Torcina and Villocino 2023). Similar concerns have been raised by college instructors handling general education courses. Bugwak (2021) identified additional challenges faced by these educators, including difficulties in answering student questions and asserting authority in class due to their lack of expertise in the subjects they teach.

4.1.5. Region of origin

The majority of respondents are from the National Capital Region, accounting for 33.47% of the total, while Regions 7 – Central Visayas, 12 – SOCCSKSARGEN, 13 – Caraga, and 16 – CAR each have only one respondent (0.004%).

The regions with low response rates are characterized by high-poverty and high-minority schools, where teacher shortages force educators to teach subjects outside their areas of expertise. This shortage is primarily driven by challenges in attracting qualified educators due to lower salaries and poor working conditions (Sutcher et al. 2019). One contributing factor to the low response rate is limited access to stable internet connectivity, as the survey was conducted online. Additionally, extreme weather conditions during data collection further hindered survey participation. Furthermore, educational infrastructure in rural areas is often inadequate, making it difficult to support effective teaching. To address these challenges, teachers can be trained in technology education and deployed to rural schools that lack adequate technological resources.

Table 6. Region of origin of participants

Geographical Division	Region	Percentage (%)
Luzon	NCR	33.47
	CAR	0.004
	I - Ilocos	11.61
	II - Cagayan Valley	8.57
	III - Central Luzon	4.49
	IV-A - CALABARZON	7.76
	IV-B MIMAROPA	2.86
	V -Bicol	3.27
Visayas	VI - Western Visayas	11.61
	VII - Central Visayas	0.004
	VIII - Eastern Visayas	0.81
Mindanao	IX - Zamboanga Peninsula	0.81

X - Northern Mindanao	2.86
XI - Davao	11.62
XII - SOCCSKARGEN	0.004
XIII - Caraga	0.004
XIV - BARMM	1.22

Source: Authors' compilation from survey responses.

4.1.6. Years of teaching experience

The average teaching experience among the teacher respondents is 11.21 years, with a standard deviation of 7.80. Most respondents have at least 11.21 years of teaching experience. The minimum recorded teaching experience among the respondents is less than one year, while the maximum is 40 years. Studies suggest that teaching performance and competence are not solely predicted by years of teaching experience. However, continuous professional support and learning should be prioritized for all teachers, regardless of age or teaching experience (Graham et al. 2020; Montederamos and Canon 2024). Research suggests a decline in teaching quality among teachers with four to five years of experience if they do not engage in career development or advancement activities. This phenomenon is known as a career plateau. It occurs when educators face limited opportunities for professional growth, advancement, or development, typically emerging within four to five years of teaching. During this stage, teachers may feel confident and skilled in their roles but perceive little need for further career progression or exploration of alternative professional paths (Zamir 2018; Veliz and Mainsbridge 2024). This stagnation often stems from factors such as inadequate institutional support or restricted access to professional development programs, leading to feelings of disempowerment and a diminished sense of professional value. As a result, teachers experiencing career stagnation may lose motivation to pursue advancement within the education system (ibid.). Given these findings, the ideal time to implement interventions for teachers is before they complete their fifth year of service.

4.1.7. Grade level taught

Teacher preparedness is crucial; therefore, sufficient training and professional development opportunities are necessary to help educators adapt to new pedagogical and instructional methods that align with the demands of the new curriculum (Baniqued and Bautista 2024). The majority of respondents teach at the junior high school level, accounting for 38.37% (94 teachers). This is followed by those teaching at the elementary level, comprising 32.65% (80 teachers), and those at the senior high school level, which represent 21.63% (53 teachers). Additionally, nearly five percent (4.49% or 11 teachers) have experience teaching at both the junior and senior high school levels, while approximately two percent (2.45% or 6 teachers) have taught at both the elementary and junior high school levels.

Table 7. Distribution of teachers by grade level taught

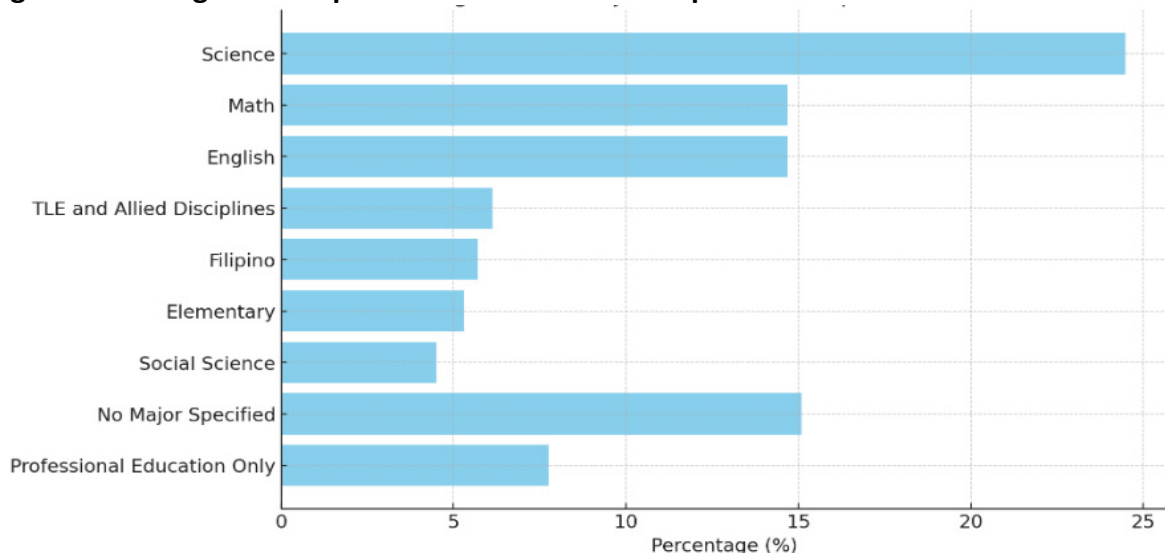
Grade Level Taught	Frequency (n=244)	Percentage (%)
Elementary	80	32.65
Junior High School	94	38.37
Senior High School	53	21.63
Both Elementary and Junior High School	6	2.45
Both Junior and Senior High School	11	4.49

Source: Authors' construction.

4.1.8. Undergraduate specialization of teacher respondents

The majority of the teacher respondents are Science majors, accounting for 24.49% (60 individuals). This is followed by Math and English majors, each comprising 14.69% (36 respondents). Other groups include Technology and Livelihood Education (TLE) and Allied Discipline majors at 6.12% (15 respondents), Filipino majors at 5.71% (14 respondents), Elementary Education majors at 5.31% (13 respondents), and Social Science majors at 4.49% (11 respondents). Additionally, 15.10% (31 respondents) did not specify their major, while 7.76% (19 respondents) hold qualifications only in professional education subjects.

Figure 3. Undergraduate specialization of teacher respondents



Source: Authors' construction.

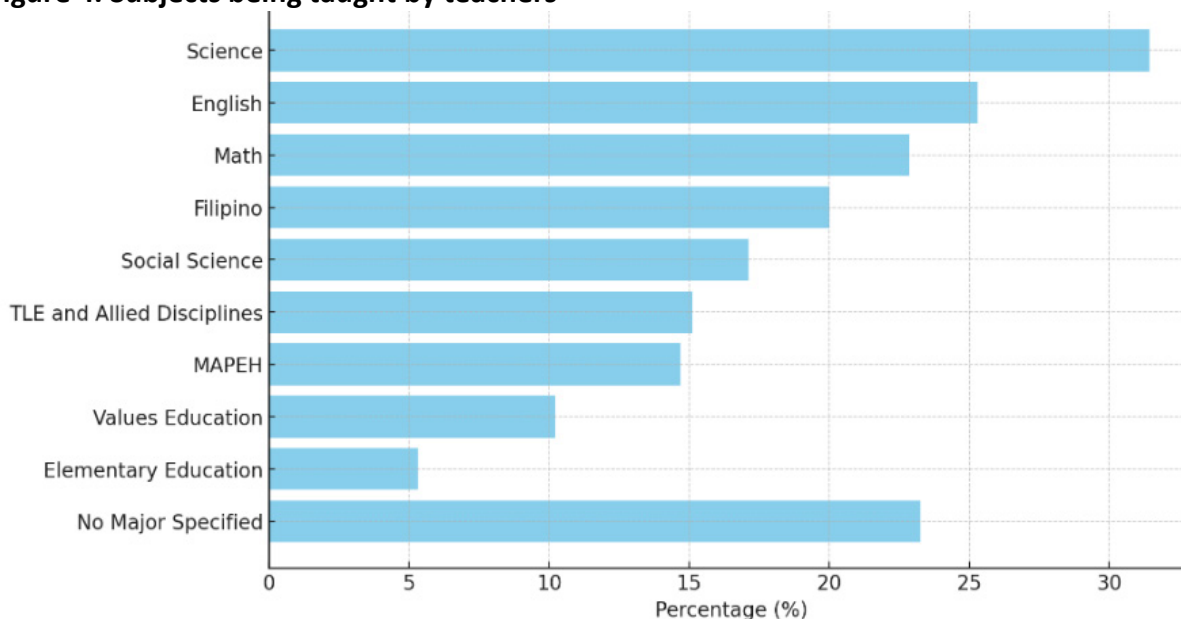
4.1.9. Other teaching certifications

Teacher respondents lack the appropriate teaching certifications for their subjects. Specifically, 77.24% (177 teachers) do not hold any additional teaching certifications, while only 27.76% (68 teachers) possess the required credentials. This finding suggests that most surveyed teachers have limited supplementary training in both content and pedagogy relevant to their areas of expertise and the subjects they currently teach.

4.1.10. Subjects being taught by teachers

The majority of the teachers surveyed are teaching science subjects, accounting for 31.43% (77 teachers). This is followed by English subjects at 25.31% (62 teachers), mathematics at 22.86% (56 teachers), and Filipino at 20% (49 teachers). Social science subjects have a 17.14% representation (42 teachers), while TLE and allied disciplines account for 15.10% (37 teachers). MAPEH subjects make up 14.69% (36 teachers), and values education comprises 10.20% (25 teachers). Elementary education subjects account for 5.31% (13 teachers). Additionally, around 23.27% (57 teachers) have majors or specializations not specified in the list (e.g., psychology, engineering, accountancy, etc.). Although the percentage for each subject was calculated relative to the total number of respondents, it is important to note that many teachers reported teaching multiple subjects. This suggests that teachers are often assigned to subjects outside their area of specialization due to staffing shortages or high demand in their respective schools. This scenario is common in small schools in both rural and urban areas. Studies have highlighted the negative impacts of this situation on teachers, such as inconsistencies in the quality of teaching materials and methods (Castro et al. 2024) and difficulties in addressing students' queries and establishing authority in the classroom (Villano-AC 2024).

Figure 4. Subjects being taught by teachers



Source: Authors' construction.

4.2. Extent of teacher's specialization and subject-taught mismatch

4.2.1 Distribution of respondents according to the matching of specialization and subjects taught

Teacher specialization is a crucial factor in ensuring quality education, as it enables educators to effectively deliver subject matter and foster better learning outcomes. However, the alignment between teachers' areas of specialization and the subjects they are assigned to teach is often inconsistent, leading to several challenges in both teaching and learning. This

discussion examines the extent of specialization-subject alignment based on the provided data and explores its implications for the education system.

Table 8 highlights variations in the alignment between teachers’ specializations and their assigned teaching subjects. Out of 245 participants, 105 teachers—or almost half (42.86%)—are mismatched, meaning they teach subjects that do not align with their pre-service specialization. This finding supports the observation that teacher-subject mismatches, also referred to as out-of-field (OOF) teaching, are a widespread issue both in the Philippines and globally (Hobbs 2013; Sharplin 2014; Shah et al., 2022). EDCOM2 has noted that this problem is particularly prevalent in the Philippines, with 62% of high school teachers in public schools teaching subjects outside their major due to systemic hiring practices that prioritize availability over expertise (Chi 2024). Similarly, Shah et al. (2022) highlighted that mismatches often result from teacher shortages and inefficient resource allocation, exacerbating systemic inequities in education.

In contrast, only 62 teachers (25.31%) are matched; teaching subjects directly aligned with their specialization. This relatively small percentage underscores the underutilization of teacher expertise, a concern noted by Generalao et al. (2022), who emphasized that professional qualifications significantly impact teaching effectiveness and student outcomes. A well-aligned teaching assignment enables educators to apply their specialized training, which is particularly critical in subjects requiring advanced content knowledge and pedagogical strategies, such as mathematics and science (Goos et al. 2020).

Additionally, 78 teachers (31.84%) fall into the category of both matched and mismatched. These teachers handle a mix of aligned and misaligned subjects, reflecting a reliance on their flexibility to fill gaps in the teaching workforce. This dual-role scenario may lead to increased workload and burnout, which Du Plessis and McDonagh (2021) identified as a common challenge faced by teachers assigned to subjects outside their specialization. Mangubos (2019) further highlighted that such mismatched assignments often lead to perceptions of reduced effectiveness, lower confidence, and job dissatisfaction among educators. These issues are particularly pronounced in underfunded schools, where inequities in teacher allocation are more prevalent (Darling-Hammond 2010; Beteille and Loeb2009).

Table 8. Distribution of respondents according to the matching of specialization and subjects taught

Matching of Specialization	F	%
Mismatched	105	42.86
Matched	62	25.31
Matched and Mismatched*	78	31.84
Total	245	100.00

Note: *Teaches both their specialization and subject(s) outside their specialization.

Source: Authors’ construction.

4.2.2. Distribution of mismatched teachers per subject

The number of teachers out of the 245 participants handling subjects not aligned to their pre-service course specialization was also examined. The distribution of mismatched in-service teachers across various subjects shown in Table 9 reveals insights into the extent and nature of

specialization-subject misalignment among the in-service teachers covered in this study. The data indicate that mismatches are prevalent across all subject areas, with varying degrees of severity.

The highest percentage of mismatched teachers is observed in the "Others" category, comprising 20.41% (50 out of 245 in-service teachers). This category covers specialized areas in senior high school tracks and junior high school subjects not covered by traditional categories, highlighting the challenges in aligning niche specializations with teaching needs. Such challenges are consistent with findings in literature, where OOF teaching emerges as a common form of mismatch, especially in contexts of staff shortages. Ingersoll (2001) identified OOF teaching as assigning teachers to subjects outside their expertise or certification, a practice often necessitated by systemic gaps in teacher availability. Similar trends were observed in rural schools, such as those in the DepEd Maguindanao I Division, where Guiaselon et al. (2023) reported significant educational qualification mismatches due to the assignment of teachers with nonrelated degrees to teach English, highlighting the intersection of subject and geographical mismatches.

Following the "Others" category, Filipino accounts for 15.51% (38 teachers), closely followed by English at 15.10% (37 teachers). These high mismatches in language subjects could be attributed to the shortage of specialized educators, forcing generalists or non-specialists into these roles. Barrot (2018) notes that curriculum shifts, such as those under the K-12 system, often exacerbate such mismatches as new subject requirements create a demand for highly specialized teachers, which existing teacher preparation programs fail to meet. The scenario and practices that are very evident in the K-12 education reform in 2013. Similarly, the introduction of the revised K-12 curriculum, the MATATAG curriculum, underscores the need for continuous teacher retraining and professional development to address alignment issues (DepEd Memorandum No. 54, s. 2023; Baniqued and Bautista 2024).

In Science, 36 teachers (14.69%) are mismatched, a significant number indicating systemic difficulties in staffing specialized areas. Ingersoll (2002) highlights that science, alongside math, consistently experiences high OOF teaching rates due to the segmented nature of these fields (e.g., biology, chemistry, physics). Additional note that all are teaching Earth Science subject in elementary and secondary levels, but this specialization is lacking in CHED's Policies, Standards, and Guidelines for Bachelor of Elementary and Secondary Education (2017).

Longitudinal studies confirm the persistence of this trend across contexts, emphasizing the need for strategic recruitment and retention of specialists. Similarly, Social Sciences accounts for 13.47% (33 teachers), with mismatches potentially arising from its interdisciplinary nature. Teachers may lack expertise in the breadth of knowledge required, which is a common challenge in subjects demanding integration of multiple disciplines (Beteille and Loeb 2009).

MAPEH reflects 12.24% (30 teachers) mismatched, a figure partly attributed to the diverse skill set these subjects require. Du Plessis (2015) emphasized the complexity of partial mismatches, where teachers may have some background in a subject but lack full certification or expertise, a challenge frequently encountered in under-resourced schools. Mathematics, at 11.02% (27 teachers), and TLE along with Values Education, each at 10.20% (25 teachers), also reflect moderate mismatches. This aligns with global observations, where math consistently faces a third of its teaching population being underqualified (Cosgrove et al. 2004; Shah et al. 2020). Additionally, TLE and Values Education require specialized training in

technical and ethical competencies, which often proves challenging for teacher preparation programs.

Elementary Education, which typically demands a generalist approach, accounts for only 2.45 percent (6 teachers) mismatched, consistent with the expectation that elementary educators are trained to cover broad curricula. In addition, the demand for early childhood education that caters learners from ages 0–8 years old, K–3, under formal basic education.

The widespread mismatches across various subjects underscore systemic challenges in aligning teacher specializations with subject demands. High mismatches in Filipino, English, and Science reflect the need for targeted recruitment and improved teacher preparation programs. Similarly, the significant mismatches in interdisciplinary subjects like Social Sciences and skill-based areas like MAPEH, TLE, and Values Education point to gaps in teacher training that need to be addressed through policy reforms, strategic professional development initiatives, and enhanced support systems for teachers.

Table 9. Distribution of the number of mismatched teachers per subject

Subjects	No. of Mismatched Teachers Handling the Subject	%
1. Science	36	14.69
2. Mathematics	27	11.02
3. English	37	15.10
4. Filipino	38	15.51
5. Social Sciences	33	13.47
6. MAPEH or allied disciplines	30	12.24
7. TLE or allied disciplines	25	10.20
8. Values Education	25	10.20
9. Elementary education (All subjects)	6	2.45
10. Others	50	20.41

Note: The percentage per subject was computed relative to the total number of respondents since the respondents indicated several subjects taught.

Source: Authors' construction.

4.2.3. Distribution of respondents according to the mismatched subjects handled

To determine the extent of subject-specialization mismatch among teachers, the number of mismatched subjects they handled was analyzed. Table 10 presents the distribution of respondents based on their teaching assignments. Of the 245 participants, 62 (25.31%) exclusively taught subjects aligned with their specialization, while 110 (44.89%) handled at least one subject outside their field. Notably, 73 respondents (29.80%) were assigned two or more subjects beyond their expertise, highlighting the prevalence of multiple mismatches among teachers.

These results indicate that a majority of the respondents (74.69%) experienced some level of subject-specialization mismatch, with nearly one-third handling multiple mismatched subjects. This suggests potential challenges in instructional effectiveness, as teachers may require additional preparation and professional development to effectively teach subjects outside their field.

Notably, the EDCOM 2 study reported that 62% of teachers were assigned to subjects outside their expertise, indicating a single-instance mismatch. However, our study, despite using convenience sampling, reveals the presence of multiple mismatches in local contexts—an aspect not emphasized in the initial EDCOM 2 findings. This aligns with the findings of Guiaselon et al. (2023), who identified a high prevalence of multiple mismatches in the DepEd Maguindanao I Division. Their study revealed that some teachers were assigned to teach entirely different subjects from their academic background—for instance, BSEd Mathematics, Agricultural Education, and Agricultural Extension graduates were reassigned to the English faculty.

The complexity of subject mismatches has been further explored by Fuentes and Jimerson (2019), who noted that teachers handling multiple mismatched subjects struggle with engaging in meaningful instructional dialogue and adapting effective pedagogical strategies across various disciplines. Similarly, Mangubos (2019) conducted a survey on Filipino teachers managing multiple out-of-field subjects and found that they often perceive their teaching strategies as ineffective, have trouble in sharing expertise, and struggle with confidence in delivering instruction.

Table 10. Distribution of respondents according to the number of mismatched subjects handled

Number of Mismatched Subjects	Frequency	%
No Mismatched Subject	62	25.31
Single Mismatched Subject	110	44.89
Multiple Mismatched Subjects	73	29.80
Total	245	100.00

Source: Authors' construction.

4.3. Teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their first quarter examination scores

The relationship between teacher specialization and subject-taught match or mismatch and students' learning outcomes, as represented by their first quarter examination scores, was examined. Out of 245 participants, 39 were included in the analysis. These participants were those who had clearly specified the examination scores of their students in the subjects they taught. Of the 39 teachers included in the analysis, 17 were classified as mismatched (coded as 0) and 22 were classified as matched (coded as 1). The first quarter examination scores of the students of the participants were standardized before the analysis.

The point biserial correlation, a special case of Pearson's correlation which measures the relationship between a binary (dichotomous) independent variable and a continuous dependent variable (Cohen 1988), was employed in the analysis. In this analysis, the binary independent variable was the teacher's specialization-subject alignment (coded as 0 for mismatched and 1

for matched), while the continuous dependent variable was the students' first quarter examination scores. The dichotomous variable was treated as having two levels, allowing Pearson's r to compute the strength and direction of the linear relationship between the groups (matched vs. mismatched) and the continuous scores. By using Pearson's formula, the analysis evaluated how well the standardized examination scores vary with respect to the two groups. This approach is standard in statistical analysis of point biserial data, as the underlying calculations and interpretation follow the same principles as those used for two continuous variables.

The results revealed a Pearson's r -correlation of 0.36, indicating a moderate positive relationship between teacher specialization alignment and students' examination scores (Table 11). This suggests that when teachers are assigned to subjects aligned with their specialization, students tend to achieve higher scores on their quarterly examinations. The statistical significance of this relationship was confirmed by a p -value of 0.023, which is below the conventional threshold of 0.05, and a degree of freedom (df) of 37. This demonstrates that the observed correlation is unlikely to have occurred by chance.

These findings are consistent with earlier research highlighting the negative effects of teacher-subject mismatch on student learning outcomes. For instance, Jenkins (2017) observed that mismatched teachers often face challenges in engaging students and delivering high-quality instruction. Additionally, Darling-Hammond (2000) and Darling-Hammond and Youngs (2002) emphasized that teacher quality, as measured by certification and specialization, is a strong predictor of student achievement. Similarly, Sheppard et al. (2020) reported that students in the US performed better when taught by certified subject specialists, especially in subjects like chemistry and physics. The significant impact of subject alignment is further reinforced by Dee and Cohodes (2008), who found that students taught by matched teachers scored higher in math and social studies.

The implications extend beyond immediate academic performance. Lee and Lee (2020) highlighted that sustained exposure to mismatched teaching negatively impacts long-term academic attainment, confidence, and engagement, particularly in mathematics and science. This aligns with Monk's (2007) findings that teachers with stronger content knowledge significantly enhance student performance, especially in advanced-level courses.

Furthermore, the confidence and pedagogical expertise associated with specialization contribute to classroom dynamics. Lau et al. (2021) emphasized that teacher confidence significantly alleviates student anxiety and fosters better engagement, particularly in subjects requiring deep conceptual understanding, like mathematics. Feiman-Nemser et al. (1989) similarly noted that mismatched teachers often struggle to make lessons engaging or connect material to real-world applications, resulting in less effective instruction.

The moderate strength of the observed correlation ($r = 0.36$) also suggests that other factors may contribute to student performance. Taylor et al. (2020) found that teaching experience, access to resources, and instructional materials often have a stronger association with student outcomes than academic qualifications alone. While alignment is critical, a holistic approach addressing these additional factors could further enhance student learning outcomes.

In conclusion, the statistically significant correlation between teacher specialization and student performance suggests a possible need for systemic interventions to improve teacher recruitment and deployment. Strategies such as targeted professional development for

mismatched teachers (Goos et al., 2020) and mentoring programs to strengthen pedagogical skills and confidence (Nguyen, 2013) may help mitigate the negative effects of subject–teacher misalignment and maximize the potential of aligned placements. However, these findings should be interpreted with caution. The quantitative results were based on a small purposive sample of only 39 teachers, resulting in limited statistical power (0.62) and restricted generalizability. Furthermore, although the researchers initially intended to use NAT scores, difficulties in obtaining access to these data despite exhausting reasonable means compelled the use of non-standardized first-quarter departmental exam scores instead, raising concerns about comparability across teachers and schools. Taken together, the small sample size, non-random sampling, and reliance on alternative outcome measures due to data accessibility constraints weaken the robustness of the results and limit the extent to which broad policy implications may be drawn. Nonetheless, despite these methodological limitations, the results provide preliminary evidence that teacher–subject alignment may influence student learning outcomes and are therefore worthy of careful consideration as an initial basis for further research and policy dialogue.

Table 11. Results of the correlation between teacher specialization-subject alignment and students’ departmental exam scores

Variables	<i>n</i>	<i>R</i>	<i>df</i>	<i>p</i> -value
Teacher Specialization-Subject Alignment and Students’ Departmental Exam Scores	39	0.36	37	.023

4.4. Teachers’ insights about the importance of their specialization and the actual subject(s) taught in relation to their students’ learning outcomes

This section highlights the study’s qualitative findings, focusing on teachers’ perspectives on the alignment of their specialization and the subjects they teach, as well as the impact of this alignment on their students’ learning outcomes. Teacher narratives offer valuable insights into classroom dynamics and their impact on educational quality. Teachers’ classroom narratives are one of the most critical influences on students’ learning results. Their knowledge and performance on the actual subject(s) taught reflect the level and quality of education and learning of the learners. As a result, it is vital to evaluate teachers’ perceptions on the importance of their expertise and subject-taught alignment. The following are general themes based on the results of the thematic analysis of the verbatim responses: student engagement and classroom dynamics, impact on student learning outcomes, challenges of teaching outside of specialization, professional development gaps and training, and systemic barriers.

4.4.1. Teacher specialization influences student engagement, classroom dynamics and learning outcomes

Table 12. Table summary of codes on student engagement, classroom dynamics, and learning outcomes

Themes	Codes	Descriptions
Student Engagement and Classroom Dynamics	<ul style="list-style-type: none"> ● Confidence in Teaching ● Enhanced Student Engagement ● Quality of Instruction ● Ability to Address Student Questions ● Curriculum Delivery Challenges ● Impact on Student Performance 	<p>The analysis focuses on key components of teaching and learning, including instructional effectiveness, classroom engagement, and the problems involved with curriculum delivery. It investigates the relationship between teacher confidence, student participation, and their combined impact on the academic success of the students. These findings provide a thorough understanding of the elements that influence educational experiences and outcomes, providing a foundation for targeted improvements.</p>

Students are less likely to engage or raise questions when taught by non-specialized teachers. Teachers’ efforts to maintain engagement can produce beneficial, albeit variable, consequences. Engagement is a two-way process, highly impacted by the teacher’s knowledge and confidence. While some teachers effectively overcome gaps through effort and innovation, these are anomalies rather than the norm. To maintain higher levels of student involvement across classrooms, a comprehensive strategy is necessary, which includes improved teacher assignments and specialized training. When teachers have a thorough and in-depth understanding of their subject matter, they can engage students more effectively, resulting in improved learning outcomes. Deep subject matter expertise allows teachers to provide higher-quality instruction, which is essential for student success. Teacher participants also agreed that the quality of instruction also relies on teachers’ expertise.

There is a noticeable difference in student engagement when taught by teachers outside their area of specialization. Students may be less likely to ask questions or engage deeply with the lessons and learning material if they sense their teacher’s lack of confidence or expertise. Conversely, some teachers reported that their efforts to engage students despite their challenges led to positive responses, indicating that teacher attitude can influence student engagement. Students may struggle to engage with the lessons and learning materials when taught by teachers who lack confidence or expertise in the subject.

Teachers often find it difficult to assess students’ understanding and performance in subjects outside of their specialization.

4.4.2. Teaching mismatch negatively affects student learning outcomes

Table 13. Table summary of codes on impact on student learning outcomes

Themes	Codes	Descriptions
Impact on Student Learning Outcomes	<ul style="list-style-type: none"> ● Variable Student Engagement ● Perceived Teacher Competence ● Impact of Subject Familiarity ● Student Perception of Teacher Confidence ● Struggles with Complex Subjects ● Motivation to Learn ● Feedback and Assessment Challenges ● Engagement Through Relatability 	The subject codes demonstrate the intricate interaction between teachers' out-of-field specialization and student responses, engagement, and comprehension, emphasizing the barriers and potential within the classroom.

Source: Authors' construction.

Out-of-field teaching has a major and complex impact on students' learning results. Teachers frequently mention that teaching subjects outside of their specialization results in reduced student performance and interest. Teachers report being less effective at conveying content in disciplines in which they are not trained, which can impede students' comprehension and application of the material.

Furthermore, teachers express worry about their capacity to deliver quality instruction outside their area of specialization. As described by one of the respondents, while students may perform well on paper and pencil examinations, they often struggled to acquire deep understanding, mastery, and retention of concepts as measured by standardized examinations measuring curriculum outcomes when taught by teachers who lack subject matter competence.

Conversely, when teachers are able to teach within their area of specialization, they report exceptional student outcomes. One teacher reported seeing more student achievement as supported by passing rates to science high schools, when they were assigned to teach their specializations.

The findings suggest that out-of-field teaching has a negative influence on student learning outcomes. Teachers struggle to engage students and deliver the depth of knowledge required for subject mastery. Improving educational outcomes requires systemic support, including professional development and appropriate assignment of teachers to areas consistent with their expertise.

4.4.3. Teachers report challenges of teaching outside specialization

Table 14. Table summary of codes on challenges of teaching outside specialization

Themes	Codes	Descriptions
Challenges of Teaching Outside Specialization	<ul style="list-style-type: none"> ● Lack of content mastery ● Increased preparation time ● Confidence Issues ● Student engagement and learning outcomes ● Need for Support and Resources 	Resolving these problems necessitates a unified endeavor to enhance support, training, and resources tailored to the distinct requirements or needs of learners and of out-of-field teachers.

Source: Authors' construction.

Teaching outside of one's area of specialization jeopardizes both educational quality and teacher wellbeing. This problem is compounded by structural issues, such as administrative practices that favor seniority over expertise. The study emphasizes the necessity of allocating teachers based on their specialization to boost their confidence and efficacy, which directly benefits student outcomes. Out-of-field teachers encounter a variety of problems in their classrooms, which have a substantial influence on both educators and students.

4.4.4. Teaching mismatch is challenged by lack of content mastery

Teachers frequently struggle to master the content of disciplines other than their specialization. This lack of familiarity can make it harder to provide effective lessons and achieve the intended learning outcomes. For example, a teacher who is assigned to teach a subject such as research but has no prior experience with it may struggle to relate concepts and appropriately assess student outputs. Teachers frequently lack the essential knowledge to teach subjects other than their specialization, making it difficult to conduct successful courses.

4.4.5. Teaching mismatch increases preparation time

Out-of-field teachers frequently spend excessive time preparing for lessons, which detracts from their ability to focus on their primary area of expertise. This preparation often involves self-study and the creation of instructional materials, which can be physically and mentally draining.

4.4.6. Teaching mismatch decreases confidence of teachers

Teaching outside one's specialization can lead to decreased confidence among educators. They may feel unprepared to answer student questions or engage effectively with the material, which can affect classroom dynamics and student engagement. Teaching outside one's specialization can lead to decreased confidence, affecting classroom dynamics and student engagement.

4.4.7. Additional support and resources may help bridge the gaps brought by teaching mismatches

Mentorship, professional development, and up-to-date, context-specific instructional resources were highly requested by teachers. According to participants, the current support systems aren't enough, and they frequently receive generic training that doesn't take their unique circumstances into account. Teaching subjects outside of one's area of expertise might be challenging due to a lack of relevant instructional resources.

4.4.8. Professional development programs may help fill specialization gaps

Table 15. Table summary of codes on professional development gaps and trainings

Themes	Codes	Descriptions
Professional Development Gaps and Trainings	<ul style="list-style-type: none"> ● Comprehensive Induction Programs ● Subject-Specific Training Workshops ● Instructional Design and Assessment Training ● Mentorship and Peer Support Programs ● Integration of Technology in Teaching ● Emotional and Psychological Support Training ● Collaborative Learning and Team Teaching 	<p>Teachers recognized the need for a variety of professional development activities to improve their teaching effectiveness, particularly when outside of their area of specialization. These include structured induction programs, subject-specific workshops, and training in instructional design, assessment, and technology integration. They highlighted the value of mentorship, peer support, and collaborative methods such as team teaching. Furthermore, training in emotional and psychological support was emphasized as vital to managing classroom dynamics and promoting student well-being.</p>

Insights from the participants suggest many essential components for training programs that aim to improve the knowledge and abilities of teachers allocated subjects outside of their specialization. Instead of short, superficial sessions, teachers stressed the need of comprehensive training programs that address the abilities and skills specified in the curriculum. Furthermore, instructional design training is highly sought after since it is essential for teachers to know how to engage students and achieve learning goals through lesson design.

Participants also proposed modifying current training models, such as the 18-day program that was previously employed. This approach allowed teachers to learn more about fewer topics in depth. Additionally, it was suggested that short courses devoted to particular topics, such as entrepreneurship, could be a good way to give teachers relevant information without overwhelming them. Teachers in non-specialty fields may find their difficulties intensified due to a lack of possibilities for specialized training and support.

The absence of mentorship or collaboration with colleagues who have expertise in the subject being taught can hinder teacher effectiveness. Additionally, coaching and mentorship programs were emphasized as crucial, allowing seasoned teachers to impart their knowledge of successful teaching techniques and strategies to their less experienced counterparts. The overarching goal is to provide instructors with long-term professional development that is thorough, topic-specific, and relevant to their given courses so that they may effectively encourage student learning and participation.

4.4.9. Systemic barriers perpetuate teaching mismatch and teacher deployment issues

Table 16. Table summary of codes on systemic barriers

Themes	Codes	Descriptions
Systemic Barriers	<ul style="list-style-type: none"> ● Bureaucratic Inefficiencies and Timeliness and Quality services (part of OPCR and IPCR) ● Gray areas in Hiring Policies and practices ● Lack of Available Specialized Teachers ● Overstaffing in Certain Departments ● Administrative Management Issues ● Limited Professional Development Opportunities ● Political Influences in Teacher Assignments ● Insufficient Communication and Feedback Mechanisms ● Inadequate Support for Teacher Well-Being ● Need for Systemic Change in Governance 	Teachers encounter barriers that include bureaucratic inefficiencies, unbalanced assignments resulting from rigid hiring practices, a scarcity of trained instructors, and insufficient support for well-being. Administrative challenges, political pressures, and inadequate or inaccessible professional development opportunities underscore the necessity for structural reforms in educational governance. Teachers' suggestions stress the need for a comprehensive plan to improve the match between teachers' areas of expertise and the subjects they teach, emphasizing the importance of strong policies implementation and monitoring, training, and support systems.

Source: Authors' construction.

The mismatch between teachers' qualifications and their assigned subjects stems from both structural and cultural issues within the education system. To mitigate these challenges, streamlined processes, data-driven decision-making, and merit-based hiring practices are essential. Addressing these barriers will not only optimize teacher placement but also promote a more equitable and efficient education system.

Based on insights gathered from the participants, several key recommendations were proposed to improve the alignment between teachers' specializations and their assigned subjects. Teachers emphasized the need to prioritize specialization in the recruitment process,

advocating for a system that ensures teachers are assigned to subjects that match their qualifications.

4.4.10. Streamlining recruitment and hiring practices may help improve teacher assignments

Improving teacher assignments can be achieved by reevaluating existing recruitment policies to prioritize specialization over seniority or political connections. As asserted by respondents, it is crucial to monitor how DepEd recruits new employees, revising criteria to emphasize specialization and experience.

Current recruitment practices are perceived to contribute to mismatches between teachers' specializations and the subjects they teach due to a lack of focus on specific subject needs during the hiring process. Teachers have expressed concerns that the existing system often relies on general rankings without considering the actual requirements of schools, resulting in assignments where teachers are required to teach subjects for which they are not qualified.

Participants suggested a data-driven hiring strategy that considers school needs assessments and aligns them with the teachers' areas of expertise to enhance existing processes. Furthermore, they advocated the decentralization of decision-making to give school administrators greater flexibility in selecting personnel based on local requirements rather than adhering strictly to centralized policies. To effectively address mismatches, it is crucial to improve communication between schools and DepEd regarding subject demands and teacher qualifications. The goal of these reforms is to establish a more efficient and effective recruitment process that ensures teachers are appropriately assigned to their respective subjects. Additionally, participants called for fundamental reforms in the school system to provide better support for teachers and ensure their assignments align with their specializations.

The study demonstrates the far-reaching implications of specialization mismatches for teaching efficacy, student learning, and teacher well-being. Addressing these challenges requires systemic change, deliberate resource allocation, and a commitment to teacher development. By focusing on these areas of concern, educational institutions across the country can foster a more robust and equitable learning environment for all stakeholders. Furthermore, cultivating a collaborative and supportive culture among educators can help mitigate the problems associated with out-of-field teaching.

In a nutshell, the participants emphasize the significance of specialized alignment in education, highlighting the necessity of deep subject matter expertise and its impact on student learning outcomes, the relevance of specific subjects, professional development requirements, systemic challenges, and student engagement. Teachers proficient in their respective disciplines can address student concerns with confidence and provide more comprehensive information, thereby enriching the entire learning process. Teaching within their area of expertise leads to superior student outcomes; however, instructing beyond this domain may result in diminished performance.

Proficiency in STEM and English disciplines requires specialized knowledge for success in both higher education and standardized assessments. The school system must prioritize training programs that align with teachers' expertise to enhance instructional effectiveness. Systemic challenges, such as leadership decisions that disregard teacher qualifications, must be addressed to ensure proper alignment as well. Competent and dedicated teachers are more likely to foster students' interest in the learning process. Ultimately, aligning teachers'

specializations with their assigned subjects is crucial for improving educational quality, enhancing student performance, and preparing educators to effectively address the challenges within their respective disciplines.

4.5. Key findings and policy implications

Table 17 below summarizes the qualitative and quantitative findings addressing the demographics and deployment of teachers, extent of mismatch and its effect on teachers, and the relation of subject-taught mismatch on the student learning outcomes.

Table 17. Table summary of findings

	Quantitative Findings	Qualitative Findings
On demographics and deployment	Out of 245 respondents, 70% are female with mean age 38; 40% are with graduate degree, 10% with doctorate degree. 33% are from NCR, with average experience of 11 years and 38% are teaching junior high school.	Systemic issues persist in deployment of teachers, perpetuating mismatches. Teachers emphasize the need for specialization and experience to be prioritized in recruitment process.
	77.24% (177 teachers) do not hold any additional teaching certifications	Teachers underscored the need for professional development activities to improve their teaching effectiveness, particularly to fill specialization gaps.
On mismatch extent and its effect on teachers	Out of 245 participants, 105 teachers—or almost half (42.86%) are mismatched or teaching outside their specialization. Only 62 teachers (25.31%) are matched, teaching subjects directly aligned with their specialization.	<ul style="list-style-type: none"> Teaching mismatch increases preparation time and decreases teacher confidence. Teachers spend more time preparing materials for subjects outside their specialization contributing to burnout. Mismatched teachers are challenged by lack of content mastery which is essential to engage students and deliver the depth of knowledge and achieve learning outcomes. Struggles on assessing student outputs are also reported.
	Filipino accounts for 15.51% (38 teachers), closely followed by English at 15.10% (37 teachers)	
	73 respondents (29.80%) were assigned two or more subjects beyond their expertise, highlighting the prevalence of multiple mismatches among teachers	
	74.69% of respondents experienced some level of subject-specialization mismatch	

<p>On the relation of teacher mismatch to student outcomes</p>	<p>a Pearson's <i>r</i>-correlation of 0.36, indicating a moderate positive relationship between teacher specialization alignment and students' examination scores</p>	<ul style="list-style-type: none"> • Teacher specialization influences student engagement, classroom dynamics, and learning outcomes. Students engage less when taught by non-specialized teachers. Student performance is also negatively affected by teacher mismatch. • Additional support and resources may help bridge the gaps brought by teaching mismatches
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5. Conclusion and recommendations

Building on the identified gaps and findings, the following policy recommendations are drawn. These focus on actionable policy recommendations to enhance pre-service preparation, teacher recruitment processes, and targeted training programs. The proposed recommendations consider the complexities of out-of-field teaching, emphasizing both short-term interventions and long-term capacity-building measures to create a responsive educational system. The following key findings underscore key areas of reform for educational policy:

- 1. Teacher specialization and learning outcomes.** Research indicates a strong correlation between teacher expertise and student achievement. Mismatched assignments reduce instructional quality and learner engagement, underscoring the need for recruitment and deployment strategies that prioritize subject-matter alignment.
- 2. Professional development and instructional resources.** Existing training programs are often insufficient and lack contextual relevance. Upgrading professional development initiatives to be subject-specific and responsive to out-of-field teachers' needs is essential. While short-term interventions such as seminars and mentorship can address immediate gaps, sustainable long-term planning remains crucial.
- 3. Systemic barriers in recruitment.** Bureaucratic inefficiencies, political influence, and rigid hiring procedures hinder effective teacher placement. Transparent and decentralized recruitment systems are necessary to ensure equitable and competency-based teacher deployment.
- 4. Support systems and teacher well-being.** Out-of-field teachers require robust support through mentorship, updated teaching materials, and professional guidance. Strengthening these mechanisms alongside providing psychosocial and stress management support can enhance teacher morale, retention, and classroom effectiveness.
- 5. Institutional and community collaboration.** Greater coordination among DepEd, CHED, and TESDA can align teacher training, certification, and deployment with school needs. Partnerships with local communities, NGOs, industries, and state universities can further contextualize teaching practices and improve education quality at regional levels.

The study revealed significant mismatches between the teachers' areas of specialization and the subjects they are assigned to teach, with notable consequences on instructional quality and student performance. Despite having substantial teaching experience, many educators continue to lack subject-specific qualifications, particularly in high-demand fields such as Science and English. This misalignment not only limits the effective delivery of content as desired but also contributes to teacher stress and diminished job satisfaction. As such, it is crucial to implement strategic workforce planning that ensures competency-based hiring, localized recruitment practices, and improved teacher deployment aligned with subject expertise.

Moreover, the findings emphasize the need for robust and targeted professional development. Teachers handling out-of-field subjects face increased preparation demands and reduced confidence in content delivery. Supporting these teachers requires specialized training

programs, mentoring systems, and instructional materials that are tailored to their actual teaching assignments. It is equally important to institutionalize mechanisms that continuously assess teacher competencies, match teaching loads appropriately, and provide feedback-driven career support systems.

To provide a full transparency of the findings and detailed policy measures, a comprehensive matrix summarizing the conclusions and recommendations for each research objective has been placed in Appendix C. This table serves as a reference for stakeholders and policymakers seeking to implement systemic improvements based on the study's evidence.

Objectives	Conclusion	Policy Recommendation
<p>To describe the teachers in terms of their professional profiles related to their specialization and subject(s) taught.</p>	<p>The teacher respondents have been teaching for at least a decade and are in their late 30s. However, they lack the proper teaching certifications for the subjects they teach and their areas of study. Their primary qualification is a bachelor's degree, which contributes to a noticeable gap in both qualifications and teaching experiences among the respondents.</p> <p>Majority of respondents have over ten years of teaching experience; nevertheless, many lack appropriate certificates or training in their respective areas. This discrepancy is affected by systemic issues, including teacher shortages and influenced recruitment methods, especially in underprivileged regions.</p> <p>Results revealed that discrepancies in subject teaching adversely affect student performance, as seen by quarterly exam scores and other national and international assessments. Teachers emphasized the significance of subject-specific expertise in enhancing teaching quality and learning outcomes, corroborating current work on the essential function of teacher specialization.</p> <p>The results align with recognized theories, like Pedagogical Content Knowledge (PCK) and Cognitive Load Theory, which underscore the significance of subject-specific expertise in promoting effective teaching and learning.</p>	<p>Implement evidence-based organizational development initiatives within the Department of Education that focus on sourcing, recruiting, training, career planning and transitions, performance management, and human capital development. These initiatives will help align the competencies of teachers with the needs of the education sector and the required career skills for Filipino educators, as defined by the Philippine Professional Standards for Teachers (PPST). The establishment of a career development framework based on the PPST should be a fundamental part of creating effective career pathways for educators. It is essential to prioritize talent and career management initiatives, especially for those educators teaching subjects outside their areas of specialization, for those who are newly entering the teaching profession, and for those who have not participated in career advancement activities for an extended period.</p> <p>Specifically, the following policy recommendations are formulated based on the findings of the investigations:</p> <ul style="list-style-type: none"> ● Sourcing and recruiting. The sourcing and recruitment standards for teacher applicants must be competency-based to ensure alignment with the required standards of excellence in the teaching profession. It is also essential for the DepEd Local Colleges in the underprivileged regions to collaborate with TEIs that hold Center of Excellence (COE) status, positioning them as a talent pipeline for the various teaching specializations required by localities (demand-based offering of programs for teachers). Furthermore, offering graduate and/or micro credential programs, which may be funded by stakeholders, is vital for attracting

teachers who specialize in specific fields. These initiatives will help address the talent gap between newly hired teachers and those who have remained stagnant in their positions for an extended period.

- Training, Career Planning, and Transitioning. For teachers who have experienced stagnation in their careers, evaluating a teacher's portfolio and conducting a training needs assessment can help identify competency gaps based on (1) their specializations and (2) any misalignments between their majors and the subjects they teach. The findings from this assessment can be utilized to offer tailored career development services that support teachers in navigating their professional paths. Standardizing and contextualizing the regional needs of career progression and pathways for teachers can ensure they receive appropriate career services that align with their needs as they advance in their profession and within the communities they serve.
- Performance Management and Human Capital Resource Planning. Sourcing, recruiting, training, and career planning in the teaching profession are both competency-based and demand-driven. This makes it easier to implement targeted performance management activities and to anticipate the current and future needs of educators in different localities. It is recommended that a competency-based assessment tool be used to gauge the effectiveness of career planning and training interventions. Regular supervision by school leaders, who possess specialized expertise, is essential to ensure teachers are evaluated according to the competencies required in their fields. Additionally, any competency gaps should be addressed through a combination of career planning and training. DepEd, in collaboration with school leaders, should forecast the talent

pipeline needed in their schools and localities. By establishing this pipeline based on the specific demands of various specializations, CHED, TESDA, and other education stakeholders can ensure that the right teaching specialists are available at the right time, in the right place, and at the right cost for stakeholders. This approach will also enable localities to make informed decisions regarding systematic organizational structure, resource allocation, and strategies for future needs.

To analyze the extent of teacher's specialization and subject-taught mismatch.

The widespread mismatches between teacher specializations and their assigned subjects point to gaps in workforce planning, which may impact teaching efficiency and effectiveness and contribute to increased workload for educators. The relatively small proportion of fully matched assignments indicate a missed opportunity to maximize the use of teachers' expertise, potentially limiting teaching quality. Additionally, the adaptability of teachers handling both aligned and misaligned subjects reflects efforts to address systemic gaps, but it may also affect teachers' well-being, which contributes to increased stress and the need for more balanced staffing practices.

The study examined the issue of teacher specialization and subject mismatch by assessing the degree of congruence between teachers' degrees and their designated teaching subjects. The study, through comprehensive profile analysis, underscored notable discrepancies in teacher deployment, especially for their academic and professional specializations. The findings indicated a consistent and extensive discrepancy, with most educators instructing courses beyond their fields of specialization. This trend is especially clear in poor areas where administrators have to put staffing ahead of subject

Strategic workforce planning focused on recruiting teachers in high-demand areas such as Filipino, English, Science, and Social Science.

Pre-service Program. A comprehensive nationwide assessment and profiling of programs offered by teacher education institutions across state universities and colleges, as well as private and local university colleges, should be conducted. Profiling should encompass various levels, including national, regional, provincial, and local. For programs identified as lacking in specific areas, operational and technical support should be provided to address issues related to the shortage of teachers qualified to teach these subjects. Furthermore, the sustainability of this support must be incorporated to prevent regression and ensure long-term effectiveness. In addition, offering financial incentives, scholarships, or professional benefits should be done to attract prospective teachers to specialize in subjects with high mismatch rates.

CHED must follow strict regulation and implement a quality assurance framework in monitoring SUCs and LUCs to recruit quality teachers, not just mere compliance. Additionally, CHED must update the 2017 Policies, Standards, and Guidelines (PSG)

alignment because of limited funds and other resources. Conversely, we observed a limited percentage of fully matched assignments, suggesting an underutilization of teacher competence.

The results are in line with well-known theories, such as Pedagogical Content Knowledge (PCK), which stress how important subject-specific knowledge is for good teaching. The research corroborates current literature that associates mismatches with decreased instructional efficacy, poor student outcomes, and increased stress among teachers. Teachers exhibited adaptation in managing mismatched assignments; however, this adaptability frequently results in heightened workload and mental distress, underscoring the necessity for structural improvements.

These findings highlight the significant deficiencies in workforce planning and teacher assignment regulations. They emphasize the imperative for a more deliberate strategy regarding teacher recruitment, allocation, and professional advancement to optimize the application of educators' knowledge, enhance educational results, and foster equitable workloads within the teaching profession.

to incorporate Earth and Space as a specialization within the Bachelor of Secondary Education major in science.

SUCs administration must also formulate internal capacity faculty training programs and curricular improvement to support DepEd and TESDA program offerings.

Facilitate faculty exchange programs between Centers of Excellence (COEs) and Centers of Development (CODs) to enhance the capacity of local colleges, prioritizing specializations that are lacking in specific regions. For instance, if there is a shortage of science teachers specializing in Earth and Space, addressing this gap should take precedence before moving on to other areas of need. This targeted approach ensures that institutions can develop expertise in critical subject areas based on local demand. The main goal of the faculty exchange is to capacitate LUCs and receiving institutions in a given timeframe so that they can offer courses independently. Faculty exchange must be one of the requirements of SUCs and TEIs to be recognized as COE and autonomous SUC.

In-service Program. Utilize up to date data to map teacher specializations to subject needs and ensure optimal alignment.

- Provide technical assistance to introduce innovations on specialized training programs or certification courses tailored to areas within the “Others” category and niche subjects (e.g., research subjects and those specific to certain strands in senior high school).
- Provide upskilling opportunities for teachers assigned to mismatched subjects, particularly in language, science, and interdisciplinary domains.

To examine the correlation between teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their quarter exam scores.

The study investigated the effects of teacher specialization and subject misalignment on student learning results. The study demonstrated the influence of teacher competence on academic success by comparing teachers' specializations and discrepancies with student performance in quarterly examinations.

The research analyzed exam scores in relation to aligned and misaligned teaching assignments to achieve the objective. The results indicate a favorable relationship between teacher specialization and student achievement, highlighting the significance of subject-specific expertise for effective teaching. Students taught by educators with aligned specializations typically surpassed their counterparts in mismatched contexts, as evidenced by departmental examination outcomes. This underscores that aligning teacher expertise with teaching responsibilities improves instructional quality and promotes superior academic success.

The moderate correlation indicates that additional factors, like teaching experience, resource availability, and classroom dynamics, also affect student outcomes. This discovery corresponds with established educational theories that highlight the relationship among teacher proficiency, instructional methods, and learning results. It also

- Regularly review and assess the alignment of teacher assignments with their specializations to address mismatches proactively.
- Implement feedback mechanisms for teachers and school administrators to identify challenges and improve assignment processes.

Prioritize, ensure, and monitor teacher-subject matching in staffing decisions.

- For DepEd, strictly implement policies that prioritize aligning teachers with subjects that match their areas of specialization during the assignment process. This alignment should be a key consideration in workforce planning to improve the quality of instruction and positively impact student performance.
- Conduct regular audits of teacher qualifications to ensure alignment with their teaching assignments. This process should identify mismatches, guide professional development plans and programs, and support workforce planning to enhance instructional quality and ensure equitable access to qualified teachers.
- Provide professional development opportunities for teachers to address subject-matter knowledge gaps. These initiatives should strengthen expertise, improve instructional quality, and support effective teaching practices.
- Utilize data-driven approaches by analyzing trends in teacher supply and demand, tracking qualifications, monitoring student performance, and utilizing predictive analytics (predicting future staffing needs or forecasting increases in enrollment in specific strands). These methods ensure strategic workforce planning, effective resource allocation,

acknowledges literature that identifies extrinsic elements, such as socio-economic background and school infrastructure, as key factors influencing student achievement.

and targeted solutions to address staffing needs and improve educational outcomes.

To explore teachers' insights about the importance of their specialization and the actual subjects taught in relation to their students' learning outcomes.

The study examined the issue of teacher specialization and its effect on student learning outcomes by investigating teachers' perceptions on the relationship between their qualifications and the subjects they are assigned to teach.

To achieve the purpose, qualitative data was collected via teacher interviews and surveys, reflecting their views on the correlation between their knowledge and their capacity to effectively convey topic content. Educators constantly highlighted that specialization provides them with the requisite subject-specific knowledge and pedagogical abilities essential for engaging students, elucidating complicated concepts, and tailoring instruction to varied learning requirements. In contrast, teachers teaching beyond their area of expertise had difficulties, such as diminished confidence, heightened preparation time, and issues in rectifying student misconceptions.

Significant findings indicated that educators regard specialization as an essential element in enhancing student involvement and academic performance, especially in disciplines necessitating profound conceptual comprehension.

The research emphasizes the necessity of matching teacher assignments to their areas of expertise to enhance instructional quality and student achievement. Furthermore,

In light of the qualitative inquiries, subsequent policy proposals are presented:

- **Teacher Recruitment Policies. Decentralize Hiring Decisions:** Empower school administrators to make context-sensitive hiring decisions based on local needs and specialization requirements, such as faculty exchange programs within and between districts. Faculty exchange program wherein adjunct faculty can serve in two different schools handling their area specialization (e.g., five loads in the mother school and two loads to the other school depending on the needs of the district). Balance teacher distribution across specializations by fostering inter-school collaborations and resource sharing.
- **Provide and implement feedback mechanisms for teachers** without school administrators access to ascertain privacy and transparency of information from the grassroots level to avoid tokenism and political interference. Master teachers should follow a level of certification or accreditation before being promoted. This will ensure that master teachers are well equipped to mentor and with high content mastery.
- **Professional Development Programs. Subject-Specific:** Conduct workshops and training tailored to specific subjects, especially for teachers assigned outside their expertise. It can be in the form of a short course, extensive

educators articulated the necessity for specialized professional development and institutional support to alleviate the difficulties arising from misaligned assignments. These findings underscore the need of incorporating teacher viewpoints into legislation to guide strategies for teacher deployment, training, and resource distribution. Based on the results of the focus group discussions and KIIs, the following specific conclusions are made:

- Impact of Specialization Mismatch on Teaching Effectiveness: Teachers assigned to subjects outside their specialization face significant challenges, including a lack of content mastery, increased preparation time, and diminished confidence. These factors negatively impact classroom dynamics and student engagement, leading to lower learning outcomes.
- The necessity of mentorship, access to experts, professional development programs, relevant instructional materials, and collaboration among teachers to facilitate teaching outside of their specialization was underscored by the participants in a study. They underscored the significance of professional development in providing educators with the necessary knowledge and skills to teach subjects that are not within their area of expertise. Additionally, they emphasized the necessity of contextualized and updated instructional materials, as the current resources are frequently obsolete or unsuitable for the specific teaching contexts. Mentorship programs were also recommended as an essential support mechanism, particularly for the benefit of less experienced

training for more than 5 days, or micro credentialing. Upgrading and capacitating the regional centers of NEAP might also contribute to a more accessible professional development program for teachers. Instructional Design and Assessment: Equip teachers with skills in lesson planning, instructional strategies, and assessment techniques. Mentorship Programs: Pair less-experienced teachers with seasoned mentors to provide guidance and foster collaboration. Emotional and Psychological Support: Include self-care, stress management, and emotional intelligence training to address teacher well-being. TESDA-oriented schools should provide teachers with professional training and scholarships for national certification needed for their teaching. This will ensure that teachers are qualified in teaching and assessing technical and vocational skills (i.e., intended for TVET/TECHVOC strands of senior high school).

- Systemic Support. Streamlined Bureaucracy: Simplify administrative processes to reduce delays in teacher deployment and access to resources. Enhanced Communication Channels: Establish regular feedback mechanisms between schools and education departments to address specific needs promptly. Mitigate Political Influences: Enforce transparent hiring and promotion practices focused on merit and specialization. Mitigate the “Padrino System” in the teacher hiring process that affects the selection of deserving candidates. Provide facilities and infrastructure needed for technical and vocational course offerings and STEM equipment.
- Monitoring and Evaluation. Implement robust systems for evaluating teacher assignments and their alignment with specialization. Create platforms for teachers to share

educators. Nevertheless, the inquiry observed that there is a lack of uniformity in the availability of proficient teachers/mentors and the degree of collaboration among the teachers.

- The current support systems for teachers outside their specialization are regarded insufficient, with plenty of teachers citing a lack of training, insufficient instructional materials, and minimal mentorship opportunities. Numerous professional development programs are repetitive and fail to provide teachers with novel insights or skills that are relevant to their needs. This emphasizes the necessity of improved support systems, such as mentorship, professional development, pertinent instructional materials, and access to experts, to enable effective teaching beyond their area of expertise.
- Systemic Barriers: Bureaucratic inefficiencies, rigid recruitment practices, political influences, and limited professional development opportunities exacerbate teacher-specialization mismatches.
- Teacher Well-Being: Teaching outside specialization increases stress and reduces motivation, negatively affecting teacher well-being and overall classroom effectiveness.
- Role of Professional Development and Collaboration: Teachers' value professional development but emphasize the need for contextualized, subject-specific training. Collaborative and mentorship programs could alleviate challenges.

challenges and solutions, informing policy improvements. Provide and implement feedback mechanisms to monitor and evaluate teachers' comments at the classroom level without school administrators' intervention and free from political interference to ensure confidentiality and transparency of information

Interventions at the preservice level aimed at addressing the low supply of graduates in specific majors, such as faculty exchange programs and technical assistance for curriculum development, as well as in-service initiatives like teacher training, and mentoring of teacher by instructional leaders. Establish a systematically regulated framework for micro-credentials that undergo continuous monitoring and evaluation. Such assessments are crucial for determining their effectiveness, alignment with curriculum developments and emerging demands, operational efficiency, and long-term sustainability. Addressing this need necessitates the formation of a dedicated regulatory body, which remains an existing gap in the current micro-credentialing landscape in the Philippines (Peoro et al. 2024).

- Community and Stakeholder Engagement. Include local communities, NGOs, industries, and SUCs in decision-making to align teaching practices with regional needs and priorities.
- Close coordination among education agencies such as DepEd, CHED and TESDA. Ensure alignment of course offerings from CHED and training from TESDA in support of the needs of DepEd. Regional CHED and TESDA offices must conduct a needs assessment for the supply and demand of program offerings to address the mismatch of teachers in basic education (K to 12).

Further research should examine the long-term effects of subject-teacher mismatches on student career trajectories and educational inequalities, as well as the structural barriers to teacher recruitment and distribution. Additionally, future studies should explore how persistent mismatches in teacher specializations affect students' academic and professional opportunities and whether these mismatches contribute to widening educational disparities, particularly among disadvantaged student populations. Likewise, future studies may provide some details of characteristics of teachers who are mismatched, atched, and both matched and mismatched. It is also necessary to address whether the mismatched teachers are generally younger. Furthermore, research should investigate how bureaucratic bottlenecks, imbalanced teacher deployment, and rigid hiring standards exacerbate subject-teacher mismatches. Implementing decentralized hiring, merit-based recruitment, and data-driven teacher assignments may help mitigate these mismatches. Understanding these broader implications will provide deeper insight into how persistent imbalances affect employment readiness, national development, and educational equity, ultimately informing more effective policy decisions.

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Appendices

Appendix A

STUDENT OUTCOME PERCEPTION INVENTORY

Directions: Read each statement carefully and evaluate your level of agreement.

Key Questions	Strongly Disagree	Disagree	Agree	Strongly Agree
	1	2	3	4
1. My teachers' lessons are important to my academic achievement.				
2. I am motivated to do my best in my studies because my teachers provide relevant information that I can use in my studies.				
3. I get better grades and test scores when my teachers teach their content areas well.				
4. I feel that my teachers use appropriate teaching strategies and techniques for me to learn at my best.				

<p>5. My teachers provide me with opportunities to apply what I learned in real life.</p>				
<p>6. My teachers are experts in their respective disciplines.</p>				
<p>7. I feel that my teachers who are experts in their disciplines and teach their field of expertise help me as a student to learn better.</p>				
<p>8. I learn better from my teachers who teach their specializations than those who do not.</p>				
<p>9. My teachers who are experts in their field of expertise and teaching their respective subject areas use appropriate teaching strategies and techniques that maximize my learning.</p>				

10. I am engaged when I feel that my teachers are experts in their respective disciplines.				
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Appendix B

Focus Group Discussion Questions

I. Teachers' Profile

Personal Profile

1. Name (optional):
2. Sex:
3. Age (in years):
4. Province
5. Region:

Professional Profile

1. Degrees Obtained:
 - a. Bachelor's Degree:
 - b. Master's Degree:
 - c. Doctorate Degree:
 - d. Other degree obtained and specialization (if any):
2. Grade Level(s) Taught:
3. Subject(s) Taught:
4. Number of Preparation:
5. Current School:
6. Number of Years in the Service:

II. Challenges of Teaching Outside Specialization

1. Can you describe a specific situation where teaching outside your specialization posed a significant challenge? What were the immediate impacts on your teaching?
2. How do you adapt your teaching methods when teaching a subject you're less familiar with? Can you give examples of strategies that have worked or not worked?
3. How does teaching a subject outside your specialization affect your ability to meet curriculum standards and learning goals? (Scale of 1-10; please rate your experience.)

III. Frequency and Impact on Teaching Experience

4. Over the past few years, how often have you been assigned subjects outside your specialization? How has this trend evolved over time?
5. How does teaching outside your specialization affect your job satisfaction and motivation? Have you experienced burnout due to these assignments?
6. Are there particular subjects outside your specialization that you find easier or more challenging to teach? What factors contribute to this?

IV. Confidence Levels

7. How does your confidence level change when teaching subjects outside your specialization compared to those within your area of expertise?
8. In what ways does your confidence, or lack thereof, influence your classroom dynamics and student engagement?
9. Have you ever declined teaching assignments due to feeling underprepared? How was that situation handled?

V. Impact on Student Learning Outcomes

10. Based on your experience, how do students generally respond when you teach outside your specialization? Do you notice differences in their engagement or understanding?
11. Are there specific areas in the curriculum where you believe students struggle more when taught by teachers outside their specialization? Can you provide examples?
12. How do you compensate for any gaps in your knowledge to ensure students still achieve the desired learning outcomes?

VI. Importance of Specialization Alignment

13. How critical do you think it is for teachers to have deep subject matter expertise in the subjects they teach? Can you share examples from your experience?
14. In your opinion, are there certain subjects where specialization is more important than others? Why?

VII. Examples of Impact on Students

15. Can you recall a time when teaching within your specialization led to exceptional student outcomes? What made the difference?
16. Conversely, can you share an instance where teaching outside your specialization resulted in lower student performance? What could have been done differently to mitigate this?

VIII. Support and Resources

17. What specific resources or support (e.g., professional development, instructional materials, mentorship) would make teaching outside your specialization easier?
18. How would you rate the effectiveness of the current support systems available to teachers assigned subjects outside their specialization?

IX. Improving Alignment

19. What steps could the school administration or Department of Education take to better align teachers' specializations with the subjects they are assigned? What would be your top priority?
20. Are there any systemic barriers that you believe prevent better alignment between teacher specializations and subject assignments? How can these be addressed?

X. Training Programs

21. In your view, what specific skills or knowledge areas should be included in training programs for teachers who are assigned subjects outside their specialization?
22. Can you suggest any existing training models or programs that could be adapted to help teachers develop competency in teaching subjects outside their expertise?

XI. Recruitment and Assignment Policies

23. What changes do you think should be made to the recruitment and assignment policies to better match teachers with their specializations?

How do you think the current recruitment practices contribute to the issue of specialization and subject-taught mismatch, and what can be done to improve this?

Appendix C

Key Findings and Policy Recommendations

Objectives	Conclusion	Policy Recommendation
<p>To describe the teachers in terms of their professional profiles related to their specialization and subject(s) taught.</p>	<p>The teacher respondents have been teaching for at least a decade and are in their late 30s. However, they lack the proper teaching certifications for the subjects they teach and their areas of study. Their primary qualification is a bachelor’s degree, which contributes to a noticeable gap in both qualifications and teaching experiences among the respondents.</p> <p>Majority of respondents have over ten years of teaching experience; nevertheless, many lack appropriate certificates or training in their respective areas. This discrepancy is affected by systemic issues, including teacher shortages and influenced recruitment methods, especially in underprivileged regions.</p> <p>Results revealed that discrepancies in subject teaching adversely affect student performance, as seen by quarterly exam scores and other national and international assessments. Teachers emphasized the significance of subject-specific expertise in enhancing teaching quality and learning outcomes, corroborating current work on the essential function of teacher specialization.</p> <p>The results align with recognized theories, like Pedagogical Content Knowledge (PCK) and Cognitive Load Theory, which</p>	<p>Implement evidence-based organizational development initiatives within the Department of Education that focus on sourcing, recruiting, training, career planning and transitions, performance management, and human capital development. These initiatives will help align the competencies of teachers with the needs of the education sector and the required career skills for Filipino educators, as defined by the Philippine Professional Standards for Teachers (PPST). The establishment of a career development framework based on the PPST should be a fundamental part of creating effective career pathways for educators. It is essential to prioritize talent and career management initiatives, especially for those educators teaching subjects outside their areas of specialization, for those who are newly entering the teaching profession, and for those who have not participated in career advancement activities for an extended period.</p> <p>Specifically, the following policy recommendations are formulated based on the findings of the investigations:</p> <ul style="list-style-type: none"> ● Sourcing and recruiting. The sourcing and recruitment standards for teacher applicants must be competency-based to ensure alignment with the required standards of excellence in the teaching profession. It is also essential for the DepEd Local Colleges in the underprivileged regions to collaborate with TEIs that hold Center of Excellence (COE)

underscore the significance of subject-specific expertise in promoting effective teaching and learning.

status, positioning them as a talent pipeline for the various teaching specializations required by localities (demand-based offering of programs for teachers). Furthermore, offering graduate and/or microcredential programs, which may be funded by stakeholders, is vital for attracting teachers who specialize in specific fields. These initiatives will help address the talent gap between newly hired teachers and those who have remained stagnant in their positions for an extended period.

- Training, Career Planning, and Transitioning. For teachers who have experienced stagnation in their careers, evaluating a teacher's portfolio and conducting a training needs assessment can help identify competency gaps based on (1) their specializations and (2) any misalignments between their majors and the subjects they teach. The findings from this assessment can be utilized to offer tailored career development services that support teachers in navigating their professional paths. Standardizing and contextualizing the regional needs of career progression and pathways for teachers can ensure they receive appropriate career services that align with their needs as they advance in their profession and within the communities they serve.
- Performance Management and Human Capital Resource Planning. Sourcing, recruiting, training, and career planning in the teaching profession are both competency-based and demand-driven. This makes it easier to implement targeted performance management activities and to anticipate the current and future needs of educators in different localities. It is recommended that a competency-based assessment tool be used to gauge the effectiveness of career planning and training interventions. Regular supervision by school leaders, who possess specialized expertise, is essential to

ensure teachers are evaluated according to the competencies required in their fields. Additionally, any competency gaps should be addressed through a combination of career planning and training. DepEd, in collaboration with school leaders, should forecast the talent pipeline needed in their schools and localities. By establishing this pipeline based on the specific demands of various specializations, CHED, TESDA, and other education stakeholders can ensure that the right teaching specialists are available at the right time, in the right place, and at the right cost for stakeholders. This approach will also enable localities to make informed decisions regarding systematic organizational structure, resource allocation, and strategies for future needs.

To analyze the extent of teacher's specialization and subject-taught mismatch.

The widespread mismatches between teacher specializations and their assigned subjects point to gaps in workforce planning, which may impact teaching efficiency and effectiveness and contribute to increased workload for educators. The relatively small proportion of fully matched assignments indicate a missed opportunity to maximize the use of teachers' expertise, potentially limiting teaching quality. Additionally, the adaptability of teachers handling both aligned and misaligned subjects reflects efforts to address systemic gaps, but it may also affect teachers' well-being, which contributes to increased stress and the need for more balanced staffing practices.

The study examined the issue of teacher specialization and subject mismatch by assessing the degree of congruence between teachers' degrees and their designated teaching subjects. The study, through comprehensive profile analysis,

Strategic workforce planning focused on recruiting teachers in high-demand areas such as Filipino, English, Science, and Social Science.

Pre-service Program. A comprehensive nationwide assessment and profiling of programs offered by teacher education institutions across state universities and colleges, as well as private and local university colleges, should be conducted. The profiling should encompass various levels, including national, regional, provincial, and local. For programs identified as lacking in specific areas, operational and technical support should be provided to address issues related to the shortage of teachers qualified to teach these subjects. Furthermore, the sustainability of this support must be incorporated to prevent regression and ensure long-term effectiveness. In addition, offering financial incentives, scholarships, or professional benefits should be done

underscored notable discrepancies in teacher deployment, especially for their academic and professional specializations. The findings indicated a consistent and extensive discrepancy, with most educators instructing courses beyond their fields of specialization. This trend is especially clear in poor areas where administrators have to put staffing ahead of subject alignment because of limited funds and other resources. Conversely, we observed a limited percentage of fully matched assignments, suggesting an underutilization of teacher competence.

The results are in line with well-known theories, such as Pedagogical Content Knowledge (PCK), which stress how important subject-specific knowledge is for good teaching. The research corroborates current literature that associates mismatches with decreased instructional efficacy, poor student outcomes, and increased stress among teachers. Teachers exhibited adaptation in managing mismatched assignments; however, this adaptability frequently results in heightened workload and mental distress, underscoring the necessity for structural improvements.

These findings highlight the significant deficiencies in workforce planning and teacher assignment regulations. They emphasize the imperative for a more deliberate strategy regarding teacher recruitment, allocation, and professional advancement to optimize the application of educators' knowledge, enhance educational results, and foster equitable workloads within the teaching profession.

to attract prospective teachers to specialize in subjects with high mismatch rates.

CHED must follow strict regulation and implement a quality assurance framework in monitoring SUCs and LUCs to recruit quality teachers, not just mere compliance. Additionally, CHED must update the 2017 Policies, Standards, and Guidelines (PSG) to incorporate Earth and Space as a specialization within the Bachelor of Secondary Education major in Science.

SUCs administration must also formulate internal capacity faculty training programs and curricular improvement to support DepEd and TESDA program offerings.

Facilitate faculty exchange programs between Centers of Excellence (COEs) and Centers of Development (CODs) to enhance the capacity of local colleges, prioritizing specializations that are lacking in specific regions. For instance, if there is a shortage of science teachers specializing in Earth and Space, addressing this gap should take precedence before moving on to other areas of need. This targeted approach ensures that institutions can develop expertise in critical subject areas based on local demand. The main goal of the faculty exchange is to capacitate LUCs and receiving institutions in a given timeframe so that they can offer courses independently. Faculty exchange must be one of the requirements of SUCs and TEIs to be recognized as COE and autonomous SUC.

In-service Program. Utilize up to date data to map teacher specializations to subject needs and ensure optimal alignment.

- Provide technical assistance to introduce innovations on specialized training programs or certification courses

To examine the correlation between teacher's specialization and subject-taught mismatch and their students' learning outcomes represented by their quarter exam scores.

The study investigated the effects of teacher specialization and subject misalignment on student learning results. The study demonstrated the influence of teacher competence on academic success by comparing teachers' specializations and discrepancies with student performance in quarterly examinations.

The research analyzed exam scores in relation to aligned and misaligned teaching assignments to achieve the objective. The results indicate a favorable relationship between teacher specialization and student achievement, highlighting the significance of subject-specific expertise for effective teaching. Students taught by educators with aligned specializations typically surpassed their counterparts in mismatched contexts, as evidenced by departmental examination outcomes. This underscores that aligning teacher expertise with teaching responsibilities improves instructional quality and promotes superior academic success.

tailored to areas within the "Others" category and niche subjects (e.g., research subjects and those specific to certain strands in senior high school).

- Provide upskilling opportunities for teachers assigned to mismatched subjects, particularly in language, science, and interdisciplinary domains.
- Regularly review and assess the alignment of teacher assignments with their specializations to address mismatches proactively.
- Implement feedback mechanisms for teachers and school administrators to identify challenges and improve assignment processes.

Prioritize, ensure, and monitor teacher-subject matching in staffing decisions.

- For DepEd, strictly implement policies that prioritize aligning teachers with subjects that match their areas of specialization during the assignment process. This alignment should be a key consideration in workforce planning to improve the quality of instruction and positively impact student performance.
- Conduct regular audits of teacher qualifications to ensure alignment with their teaching assignments. This process should identify mismatches, guide professional development plans and programs, and support workforce planning to enhance instructional quality and ensure equitable access to qualified teachers.
- Provide professional development opportunities for teachers to address subject-matter knowledge gaps. These initiatives should strengthen expertise, improve instructional quality, and support effective teaching practices.

The moderate correlation indicates that additional factors, like teaching experience, resource availability, and classroom dynamics, also affect student outcomes. This discovery corresponds with established educational theories that highlight the relationship among teacher proficiency, instructional methods, and learning results. It also acknowledges literature that identifies extrinsic elements, such as socio-economic background and school infrastructure, as key factors influencing student achievement.

- Utilize data-driven approaches by analyzing trends in teacher supply and demand, tracking qualifications, monitoring student performance, and utilizing predictive analytics (predicting future staffing needs or forecasting increases in enrollment in specific strands). These methods ensure strategic workforce planning, effective resource allocation, and targeted solutions to address staffing needs and improve educational outcomes.

To explore teachers' insights about the importance of their specialization and the actual subjects taught in relation to their students' learning outcomes.

The study examined the issue of teacher specialization and its effect on student learning outcomes by investigating teachers' perceptions on the relationship between their qualifications and the subjects they are assigned to teach.

To achieve the purpose, qualitative data was collected via teacher interviews and surveys, reflecting their views on the correlation between their knowledge and their capacity to effectively convey topic content. Educators constantly highlighted that specialization provides them with the requisite subject-specific knowledge and pedagogical abilities essential for engaging students, elucidating complicated concepts, and tailoring instruction to varied learning requirements. In contrast, teachers teaching beyond their area of expertise had difficulties, such as diminished confidence, heightened preparation time, and issues in rectifying student misconceptions.

Significant findings indicated that educators regard specialization as an essential element in enhancing student

In light of the qualitative inquiries, subsequent policy proposals are presented:

- **Teacher Recruitment Policies. Decentralize Hiring Decisions:** Empower school administrators to make context-sensitive hiring decisions based on local needs and specialization requirements, such as faculty exchange programs within and between districts. Faculty exchange program wherein adjunct faculty can serve in two different schools handling their area specialization (e.g., five loads in the mother school and two loads to the other school depending on the needs of the district). Balance teacher distribution across specializations by fostering inter-school collaborations and resource sharing.
- Provide and implement feedback mechanisms for teachers without school administrators access to ascertain privacy and transparency of information from the grassroots level to avoid tokenism and political interference. Master teachers should follow a level of certification or accreditation before being promoted. This will ensure that

involvement and academic performance, especially in disciplines necessitating profound conceptual comprehension.

The research emphasizes the necessity of matching teacher assignments to their areas of expertise to enhance instructional quality and student achievement. Furthermore, educators articulated the necessity for specialized professional development and institutional support to alleviate the difficulties arising from misaligned assignments. These findings underscore the need of incorporating teacher viewpoints into legislation to guide strategies for teacher deployment, training, and resource distribution. Based on the results of the focus group discussions and KIIs, the following specific conclusions are made:

- Impact of Specialization Mismatch on Teaching Effectiveness: Teachers assigned to subjects outside their specialization face significant challenges, including a lack of content mastery, increased preparation time, and diminished confidence. These factors negatively impact classroom dynamics and student engagement, leading to lower learning outcomes.
- The necessity of mentorship, access to experts, professional development programs, relevant instructional materials, and collaboration among teachers to facilitate teaching outside of their specialization was underscored by the participants in a study. They underscored the significance of professional development in providing educators with the necessary knowledge and skills to teach subjects that are not within their area of expertise. Additionally,

master teachers are well equipped to mentor and with high content mastery.

- Professional Development Programs. Subject-Specific: Conduct workshops and training tailored to specific subjects, especially for teachers assigned outside their expertise. It can be in the form of a short course, extensive training for more than 5 days, or micro credentialing. Upgrading and capacitating the regional centers of NEAP might also contribute to a more accessible professional development program for teachers. Instructional Design and Assessment: Equip teachers with skills in lesson planning, instructional strategies, and assessment techniques. Mentorship Programs: Pair less-experienced teachers with seasoned mentors to provide guidance and foster collaboration. Emotional and Psychological Support: Include self-care, stress management, and emotional intelligence training to address teacher well-being. TESDA-oriented schools should provide teachers with professional training and scholarships for national certification needed for their teaching. This will ensure that teachers are qualified in teaching and assessing technical and vocational skills (i.e., intended for TVET/TECHVOC strands of senior high school).
- Systemic Support. Streamlined Bureaucracy: Simplify administrative processes to reduce delays in teacher deployment and access to resources. Enhanced Communication Channels: Establish regular feedback mechanisms between schools and education departments to address specific needs promptly. Mitigate Political Influences: Enforce transparent hiring and promotion practices focused on merit and specialization. Mitigate the “Padrino System” in the teacher hiring process that affects

they emphasized the necessity of contextualized and updated instructional materials, as the current resources are frequently obsolete or unsuitable for the specific teaching contexts. Mentorship programs were also recommended as an essential support mechanism, particularly for the benefit of less experienced educators. Nevertheless, the inquiry observed that there is a lack of uniformity in the availability of proficient teachers/mentors and the degree of collaboration among the teachers.

- The current support systems for teachers outside their specialization are regarded insufficient, with plenty of teachers citing a lack of training, insufficient instructional materials, and minimal mentorship opportunities. Numerous professional development programs are repetitive and fail to provide teachers with novel insights or skills that are relevant to their needs. This emphasizes the necessity of improved support systems, such as mentorship, professional development, pertinent instructional materials, and access to experts, to enable effective teaching beyond their area of expertise.
- Systemic Barriers: Bureaucratic inefficiencies, rigid recruitment practices, political influences, and limited professional development opportunities exacerbate teacher-specialization mismatches.
- Teacher Well-Being: Teaching outside specialization increases stress and reduces motivation, negatively affecting teacher well-being and overall classroom effectiveness.
- Role of Professional Development and Collaboration: Teachers' value professional development but

the selection of deserving candidates. Provide facilities and infrastructure needed for technical and vocational course offerings and STEM equipment.

- Monitoring and Evaluation. Implement robust systems for evaluating teacher assignments and their alignment with specialization. Create platforms for teachers to share challenges and solutions, informing policy improvements. Provide and implement feedback mechanisms to monitor and evaluate teachers' comments at the classroom level without school administrators' intervention and free from political interference to ensure confidentiality and transparency of information
Interventions at the preservice level aimed at addressing the low supply of graduates in specific majors, such as faculty exchange programs and technical assistance for curriculum development, as well as in-service initiatives like teacher training, and mentoring of teacher by instructional leaders. Establish a systematically regulated framework for micro-credentials that undergo continuous monitoring and evaluation. Such assessments are crucial for determining their effectiveness, alignment with curriculum developments and emerging demands, operational efficiency, and long-term sustainability. Addressing this need necessitates the formation of a dedicated regulatory body, which remains an existing gap in the current micro-credentialing landscape in the Philippines (Peoro et al. 2024).
- Community and Stakeholder Engagement. Include local communities, NGOs, industries, and SUCs in decision-making to align teaching practices with regional needs and priorities.

emphasize the need for contextualized, subject-specific training. Collaborative and mentorship programs could alleviate challenges.

- Close coordination among education agencies such as DepEd, CHED and TESDA. Ensure alignment of course offerings from CHED and training from TESDA in support of the needs of DepEd. Regional CHED and TESDA offices must conduct a needs assessment for the supply and demand of program offerings to address the mismatch of teachers in basic education (K to 12).
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