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STEM EDUCATOR SELECTION: CRITERIA AND INSIGHTS FROM PRESERVICE EDUCATORS

Y. Oulaydi [1] Y. El Madhi [2,3] F.Z. Guerss [4] M. El Qryefy [1] Z. Boumaaize [3] H. Darif [5] H. El Faylali [1]

1. Laboratory of Electronic Systems, Information Processing Mechanics and Energetics, Department of Physics, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco
youssef.oulaydi@uit.ac.ma, mouhcine.elqryefy@uit.ac.ma, hanan.elfaylali@uit.ac.ma
2. Laboratory of Education, Environment and Health (EES), CRMEF Rabat, Sale, Kenitra, Morocco
3. Laboratory of Biology and Health, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco
youssmad@yahoo.fr, zineb.boumaaize@gmail.com
4. Institute of Sports Professions, Ibn Tofail University, Kenitra, Morocco, fatimazahra.guerss@uit.ac.ma
5. Scientific Institute, Mohammed V University, Rabat, Morocco, darif.hajar@gmail.com

Abstract- The lack of alignment between selection procedure components and the requirements to determine teacher effectiveness poses challenges in identifying qualified candidates for STEM education. This study explores the perspectives of 130 preservice secondary STEM teachers who participated in the 2022 selection process, employing a survey research methodology and quantitative analysis. Key findings revealed that only about 17% of participants agreed with the effectiveness of the age limit criterion, highlighting widespread concerns about fairness and potential age discrimination. Additionally, variability in the alignment between written test components and prescribed content domains raised questions about the test's relevance, while the majority of participants provided positive feedback on the interview phase, though suggestions for improvement were noted. These findings underscore the need for ongoing evaluation and refinement of selection processes to ensure they align with practical teaching needs, fostering a fair and effective system for identifying proficient educators and strengthening the education system.

Keywords: Teachers Selection, Selection Process, Teachers' Perspectives, STEM Teachers, Preservice Teachers.

1. INTRODUCTION

Education is universally acknowledged as a cornerstone for societal progress and development, with teachers playing a critical role in this essential endeavor. The caliber of an education system's teaching staff has a substantial influence on its quality [1], and research reveals that teacher quality is one of the most significant drivers of student learning outcomes [2]. Amid this recognition, there is a growing concern in many developed countries that teacher quality is declining. Decreasing trends in teacher cognitive ability have been found for UK [3], Australia [4]. Which might result in a decline in the overall efficacy of the educational system and hinder the potential for future societal advancements.

However, the effectiveness of teachers is considered to be intrinsically linked to the quality of policies that regulate their work environment, recruitment, professional development, and selection [1]. Therefore, the implementation of strong selection methods becomes crucial to retain qualified and talented candidates into the teaching profession. Additionally, the appeal of the teaching profession to students is a key factor in attracting highly qualified candidates for the teaching positions [1], in this context, the latest report of the new developmental model committee in Morocco (CSMD) called for the necessity to make the teaching profession attractive to ensure a pool of well-qualified candidates for the entry examinations [5].

Nonetheless, the 2018 reports from the Program for International student's assessments (PISA) revealed that Moroccan students scored below the OECD average in Mathematics, science and reading [6], this sheds light on various aspects of the Moroccan educational system, including the retention of future teachers, especially in science and mathematics, indicating the need for enhancements in the selection process. Teachers' entry test is purposed to effectively evaluate the knowledge, skills, and aptitude of prospective educators, given that predicting future teachers' quality is a challenging and essential undertaking [7]. So, it needs to be investigated considering the latest reforms that Morocco have made in the selection process for prospective teacher.

While much of the existing research on teacher selection focuses on developed countries, there remains a significant gap in understanding how these processes function in developing contexts such as Morocco. For example, countries like Finland and Singapore, renowned for their high-performing education systems, employ

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rigorous and selective processes to recruit teachers, setting global benchmarks [1]. Contrasting Morocco's approaches with these international best practices could provide valuable insights into potential areas for improvement.

This study aims to carefully investigate the Moroccan selection process designed for candidates aspiring to become mathematics teachers, physics and chemistry teachers, and life and earth sciences teachers, collectively referred to as STEM teachers. This evaluation examines the progression of Moroccan STEM teachers within a global context by analyzing the preliminary selection, written tests, and interviews. Additionally, it incorporates candidates' perspectives to provide a comprehensive evaluation. By doing so, this research contributes to understanding how Morocco's teacher selection procedure aligns with international standards and the perceptions of preservice educators, offering insights for policymakers to strengthen teacher recruitment practices.

2. THEORITICAL FRAMEWORK

The selection process for prospective STEM teachers is complex and currently under scrutiny, particularly in the context of the fourth industrial revolution, which demands proficiency in digital tools and interdisciplinary methods. A 2023 study underscores the importance of STEM educators who are skilled in using technology to foster interactive learning and solve real-world problems, ensuring teachers are well-prepared to deliver multidisciplinary content for a unified and comprehensive educational experience [8].

However, concerns persist regarding the effectiveness of existing selection methods. Davies criticizes educational decision-makers for their reliance on intuition, which can introduce interviewer biases and lead to unreliable hiring decisions [9], Research in organizational psychology shows that interviewer biases often result in unreliable decisions. [10]. In response, recent research aims to refine teacher entry evaluations by identifying characteristics linked to teaching success. A 2019 meta-analysis by Klassen and Kim illustrates significant correlations between both academic attributes, like subject knowledge and teaching skills, and non-academic attributes, such as adaptability and interpersonal communication, with teacher effectiveness [11]. This ongoing research into STEM teacher selection highlights the complex challenges involved and the crucial need to assess how these challenges impact recruitment in various educational settings.

Globally, the selection practices for STEM teachers vary significantly across educational systems but typically align with the norms for other specialties within the same country, despite the smaller candidate pool available for STEM positions. High-performing countries assessed by the 2018 Program for International Student Assessment (PISA) exemplify diverse approaches. Finland, Hong Kong (China), and South Korea employ competitive examinations to select prospective teachers.

In contrast, Australia, England, and Norway do not use standardized tests but require candidates to undergo rigorous multi-year teacher training programs, certification, and credentialing [1]. Singapore's approach is distinct, incorporating probationary periods as part of its teacher hiring process [1]. Countries with robust quality assurance mechanisms, such as Macao (China) and Singapore, demonstrate superior outcomes, reinforcing the importance of stringent selection policies [13]. In Morocco, the approach to selecting STEM teachers is evolving, reflecting efforts to enhance educational quality and teacher preparedness. As outlined in the table 1, Morocco is working towards strengthening its teacher training programs and implementing more structured recruitment processes to better align with international standards, aiming to elevate the overall competency and readiness of its STEM educators.

Table 1. Overview of entry requirements into the teaching profession across selected countries

Country	Entry Requirements	Unique Features
Finland	Master's degree required; candidates must complete pedagogical studies and guided teaching practice	High degree of professional freedom; continuous professional development and community involvement are emphasized
Singapore	Completion of the National Institute of Education program; registration with the Ministry of Education	High standards for ongoing professional development and a strong emphasis on leadership and ethical standards
South Korea	Bachelor's degree followed by teacher certification exams; mandatory professional development for certification renewal	Focus on subject-specific expertise and regular participation in professional learning communities
Australia	Bachelor's degree in education or a bachelor's degree in another field plus a postgraduate teaching diploma	Flexible pathways into teaching with a strong focus on practical experience and initial teacher education
Morocco	Bachelor's degree required; candidates undergo professional training at Regional Centers for Education and Training Professions	Emphasis on continuous professional development and practical training through virtual platforms and local institutes

Improving novice teacher selection in Morocco ran alongside global and national changes, following the Bologna Declaration in 1999, which promoted the organization of teacher education within universities, Morocco has progressively harmonized the qualifications of teacher education institutions with university degrees. As a result, teacher training at all levels in Morocco has started to conform to specific university degree programs, fostering a greater reliance on higher education to produce high-quality candidates [14]. Consequently, the national education and training charter of 1999 directed the 2009-2012 emergency plan, with the goal of renovating teacher selection through criteria definition, creating university education pathways program (Licence/BA Degree in Education), creating regional centres of education and teaching profession, and promoting ongoing teacher skill enhancement [14].

Despite these efforts, persisting challenges were reported, the higher committee of education highlighted notable misalignments between degrees and sector

requirements, particularly in primary education. Consequently, the strategic vision reform plan for 2015-2030 reiterated reforms, emphasizing compatibility, empowerment and attractiveness of the teaching profession [5]. As Morocco navigates the complex intersection of global education trends and local demands, its journey provides valuable insights for evaluating and improving educational strategies. To gain a clearer understanding of recent developments, it is essential to delve into the specific phases and details of this process in the past few years.

The selection procedure for preservice teachers in Morocco involves an annual entry test, overseen by the regional Academies of Education in accordance with directives from the Ministry of Education [15]. This examination is conducted simultaneously for candidates for all educational levels, encompassing primary and secondary education. Notably, it encompasses secondary science educators, including those specializing in mathematics, physics, chemistry, and life and earth sciences. The selection process is organized in many stages, mainly it unfolds in three distinct stages for candidates, the preliminary selection process, the written tests, and the interview phase, lead up to the announcement of successful candidates who will undergo a year of training at regional education professions and training centers, followed by an additional year of taking full responsibility of the classroom [17]. Over recent years, these three phases have undergone substantial modifications, which was pertinent to the candidacy of preservice STEM teachers, as delineated below:

2.1. Preliminary Selection of Candidates

The preliminary process of candidates' selection for eligibility to proceed to the written test has been primarily focused on ensuring that individuals meet the required conditions for participation. These prerequisites have included Moroccan nationality, age limit, absence of a criminal record, the possession of an appropriate bachelor's or equivalent degree relevant to the teaching position applied for, and a careful examination of the candidacy file [17]. During the period from 2016 to 2020, no additional selection criteria were introduced; the main emphasis was on participation requirements. Which involved age restrictions, initially stipulating that candidates should be below 47 years of age [16].

However, significant changes were introduced in 2021, By exempting graduates with degrees in education from grade-based selection in the preliminary process, a selective framework was established, simultaneously imposing such criteria on other graduates. In addition to the age limit being further reduced, to individuals under 30 years of age [16], potentially raising concerns about age discrimination in hiring practices, as described by the united nations in its latest reports, age discrimination is not only a significant societal issue, but also carries a substantial economic burden, costing economies billions of dollars worldwide[17], and according to Brogatta despite that a number of public services in United states used age limitation in various job applications, they have been lifted out in many areas such as education [18].

However, in areas where age limits were enforced, organizational leaders often succumbed to negative stereotypes about older workers. This bias led to missed opportunities to hire or retain some of the most skilled and productive members of the workforce [19]. emphasize that by avoiding the employment of older individuals, managers overlook the substantial capabilities and experience these workers bring to the table. In conclusion, no research indicates that being over 30 years old makes a teacher candidate less effective as an educator.

2.2. Written Test

In the selection process for preservice STEM teachers, the written test is a pivotal phase that has evolved over time. Prior to the examination, candidates are informed of the content domains to be assessed in the test, with the National Center of Evaluation and Examination responsible for announcing these crucial details [16]. The format and structure of these written tests have undergone significant changes over the years. The written test for secondary STEM teachers comprised of two distinct components, the first component is a test in educational skills and knowledge, assessing candidates' teaching competencies and their understanding of educational principles.

The second part of the written test, featuring a speciality examination, evaluates candidates' subject knowledge and mastery within their specific area of expertise [20]. In anticipation of an enhanced written test administration, numerous adjustments were implemented. The 2022 written examination comprised two components, this comprehensive examination included the earlier specialization test, along with an assessment of educational sciences and Didactics of the subject, the latter assesses candidates' proficiency in the psychology of education, sociology of education and pedagogies aligned with the school subject.

The Ministry of education subsequently issued distinct documents outlining the content domains for written tests of science teacher candidates in various specializations, such as life and earth sciences, physics and chemistry, and mathematics. The anticipated impact of these specific modifications lies in their potential to significantly influence the identification of qualified candidates. However, concerns arise due to a lack of research discussing the rationale behind these adjustments within the national context. The absence of evaluations and assessments for the entry test raises serious questions about its effectiveness and the need for future refinements. Implementing various changes in a written test without due consideration for its efficacy and validity in the Moroccan context may compromise its predictability in identifying qualified candidates. Neglecting these aspects could have multiple implications for the selection process of preservice teachers [21].

2.3. Interview

Following the written examination, successful candidates progress to the interview phase, wherein a panel of experts conducts a comprehensive assessment of their aptitude for teaching through an operational situation. This assessment framework, outlined in 2012, comprises three essential components. The first component evaluates candidates' language proficiency in communication and assesses their technological competencies.

The second component appraises the candidate's expertise and preparedness to teach within their specialized subject area, measuring their professional competence based on the official curriculum and educational guidelines. The third component assesses the candidate's professional and ethical preparedness for the teaching profession's responsibilities through an operational situation related to professional practice. It also incorporates a psychological test to evaluate the candidate's commitment to student service, enthusiasm for teaching, and awareness of their duties [22].

It is noteworthy that, to our knowledge, apart from announcing interview details within the call for candidacy, no official documents specifying content domains for the interview phase have been published since 2012. In 2016, teachers' recruitment announcement indicated that the interviews would involve the preparation of a designated lesson within three hours, followed by a 30-minute presentation to a jury and a 20-minute discussion [15]. In 2017, the announcement specified that the interview would comprise a 30-minute general discussion on educational matters and the teaching profession [23].

There were no further changes until 2022 when it was announced that the interview test would involve preparing a given operational educational scenario over two hours, followed by a 20-minute presentation and a 30-minute discussion, a format similar to that of 2016 [24]. This multi-faceted nature of the interview is designed to equip candidates for a responsible teaching career in the secondary education system. It seeks to assess both academic and non-academic attributes, serving as a robust mechanism to evaluate candidates' readiness for teaching. While the recent dynamic changes in the interview format highlight the adaptability of the evaluation process to align with contemporary educational priorities, it is essential to emphasize the ongoing need for evaluation and research. This continuous assessment is crucial to ensure measurable development for continual improvement.

Considering the 2018 PISA test results, which indicated less favourable performance by Moroccan students in subjects like Mathematics and Science, concerns have arisen regarding various aspects of the Moroccan education system, including the selection process for future STEM teachers. Given The recent modifications in Morocco's teacher selection process, particularly the changes introduced in the 2022 entry examination, might mark a significant step in aligning with global standards. However, the absence of comprehensive research evaluating the effectiveness of these adjustments raises concerns about their long-term impact on candidate identification and, subsequently, the quality of education.

The shift in age limits, exemption for education graduates, and alterations in the written test components and the interview phase highlight the dynamic nature of teacher selection policies, Importantly, to our knowledge, there is no existing research on the selection process of STEM teachers in the Moroccan context. Ongoing research and evaluation are essential to ensure that these changes successfully identify proficient candidates and contribute to the continuous improvement of the education system. This study aims to address this research gap by examining the perspectives of preservice STEM teachers on different stages of the selection process, including preliminary selection, written tests, and interviews. The objective is to identify challenges and issues in these stages that, when addressed, could enhance the selection of future STEM teachers and inform the development of effective policies and interventions. To explore these issues, the following research questions were posed:

- How do preservice STEM teachers perceive the preliminary selection criteria, including age, exemptions for education degree holders, and the perceived fairness of the selection process in candidate selection?
- How did preservice STEM teachers perceive the organizational aspects of the interview and written test in the entry examination? Did the written test in the specialization subject and Didactics and Educational sciences align with the prescribed content domains?
- To what extent did the written and interview process effectively assess candidates' readiness for teaching in their specialization and align with the content taught in university?

3. RESEARCH METHODOLOGY

3.1. Research Design

In this study, a quantitative research methodology was employed to collect and analyze data from a sample of preservice STEM teachers within the regional center of professions in education and training in Rabat, Morocco. The survey research design utilized in this investigation was meticulously developed and refined prior to its administration to the participants. The principal objective of this research endeavor is to gain insights into the perspectives held by preservice STEM teachers concerning the most recent selection process administered in 2022 for aspiring science educators. This methodological framework affords us the opportunity to comprehensively assess the viewpoints of preservice STEM teachers, marking an initial stride towards the comprehension and potential enhancement of the designed selection process for preservice science educators.

3.2. Participants

The research sample consisted of 130 preservice STEM teachers, representing 41.7% of the total population of 312 affiliated with the Regional Center for Education and Training in Rabat, Morocco. These participants were selected from the cohort of teachers who successfully passed the December 2022 teacher selection competition, ensuring their direct relevance to the study's objectives. Participant demographics are summarized in Table 2.

A power analysis confirmed that a minimum sample size of 64 participants was required to detect a medium effect size (d=0.5) with 80% power at a 5% significance level. Consequently, the achieved sample size of 130 was more than sufficient to ensure the reliability and validity of the study's findings. The simple random sampling method was employed to select participants. This approach was chosen because it ensures that every individual in the target population had an equal chance of being included, thereby minimizing selection bias and enhancing the representativeness of the sample. By capturing a substantial portion of the population, this method facilitated a robust analysis while maintaining fairness and objectivity in participant selection.

Table 2. Demographics of the participating sample of preservice STEM teachers

Factors	Categories	Frequency	Percentage (%)
Gender	Female	76	58.5
	Male	54	41.5
Age	Between 20 and 23 years old	64	49.2
	Between 24 and 26 years old	40	30.8
	Between 27 and 30 years old	26	20
Marital status	Divorced	2	1.5
	Married	12	9.2
	Single	116	89.2
Specialty	Life and Earth Sciences	18	13.8
	Mathematics	74	56.9
	Physics and Chemistry	38	29.2
Type of BA/ Licence	Degree in Education	38	29.2
	Degree in fundamental studies	84	64.6
	Equivalent Degree	8	6.2
Highest education attained or currently pursuing	Licence/BA	72	55.4
	Master	54	41.5
	Ph.D.	4	3.1
Time of BA/ Licence attainment	2022	62	47.7
	2021	24	18.5
	Prior to 2021	44	33.8
Teaching Experience	No Experience	54	41.5
	< 1 year	54	41.5
	[1-3] years	20	15.4
	>3 years	2	1.5

3.3. Instruments

In this study, we carefully designed a survey questionnaire consisting of 27 items. The selection of these items was a deliberate and thoughtful process, incorporating both a focus group and a pretest, adhering to the basic guidelines of effective questionnaire design (Rya and Parker, 2014). The focus group comprised 2 STEM teachers' educators actively involved in teacher selection processes and 2 preservice STEM teachers. Building upon the valuable insights obtained from the focus group, the questionnaire underwent a subsequent refinement phase. This included a pretest involving a sample of 20 preservice STEM teachers to assess questionnaire clarity, comprehensiveness, and acceptability.

Additionally, content validation was conducted by a panel of three experts, consisting of two science educators specializing in teacher training at the Regional Center for Education and Training Professions (CRMEF) in Rabat and Meknes. These experts possess extensive experience in instructing preservice STEM teachers, complemented by the expertise of a postdoctoral researcher specializing in education and survey design.

The overarching goal of this instrument is to explore preservice STEM teachers' perceptions regarding the selection process. The questionnaire is structured into three principal sections: Demographic Information The first section includes 8 items aimed at collecting essential demographic data from respondents. These items cover information such as gender, age, teaching experience, the specific subjects taught, academic qualifications, and the highest degree attained.

Perceptions of the Preliminary Selection Process The second section comprises 5 items designed to explore teachers' opinions regarding the initial selection process. This section focuses on aspects such as the age limitation criteria, the fairness of the selection process based on qualifications, and respondents' perceptions of potential areas for improvement in future selection procedures. Evaluation of the Written Test and Interview Phase The third section contains 14 items intended to assess teachers' perspectives on written examination and interview stages.

These items evaluate organizational aspects, adherence to procedural standards, the conditions under which each test was conducted, and the perceived effectiveness of these stages in the selection process. A five-point Likert scale was employed for the second and third sections, with response options ranging from 5 (Strongly agree) to 1 (Strongly Disagree), while the first section utilized closed-ended questions. In terms of the questionnaire's internal consistency, Cronbach's alpha coefficient yielded a value of 0.823, indicating an acceptable level of reliability.

3.4. Procedure and Data Collection

Following the development and validation of the questionnaire, it was administered to Moroccan preservice STEM teachers at the Regional Center for Education and Training Professions in Rabat. The distribution was facilitated through the utilization of Google Forms to ensure efficiency and ease of response collection. Measures were implemented to guarantee the confidentiality and security of participants' responses. Ethical considerations included obtaining informed consent from participants.

The sampling approach employed for participants' selection was the simple random sampling method, ensuring that each potential participant within the target population had an equal opportunity to be included in the study, Data collection took place over a one-month period, commencing on the 10th of May and concluding on the 11th of June 2023, aligning with the academic calendar, and provide a sufficient timeframe for the in-person collection of responses from the participants. upon collecting the responses from the participants, the acquired data were analyzed with SPSS version 23, including descriptive statistics like frequency, percentage, mean, standard deviation and Sperman's to interpret the questionnaire responses.

4. FINDINGS

4.1. The Preliminary Selection Process

The preliminary selection process In this subsection, we delve into the key findings derived from the analysis presented in Table 3. The results from the table shed light on preservice STEM teachers' views on the preliminary selection process. The findings presented in Table 4 and Figure 1 indicate notable patterns among the participants. A significant majority, surpassing 58.5%, expressed disagreement with the criterion that mandates candidacy to individuals exclusively under 30 years old, with only 16.9% in agreement. These results suggest a strong preference among the participants for a more inclusive approach to candidate selection, one that does not rely on age as a limiting factor.

Table 3. Views of preservice STEM teachers on the preliminary selection rocess

Cronbach's Alpha	Number of items						
0.796	5						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
	Frequency and Percentage (%)						
Q1-The age-related selection criteria serve to secure high-quality candidates	56 43.1%	20 15.4%	32 24.6%	6 4.6%	16 12.3%	2.27	1.38
Q2-Exempting education degree holders from initial selection ensures a high-quality candidate pool	68 52.3%	4 3.1%	18 13.8%	2 1.5%	38 29.2%	2.52	1.76
Q3-Initial selection ensures acquiring the most qualified candidates	24 18.5%	10 7.7%	32 24.6%	26 20%	38 29.2%	3.33	1.44
Q4-Fair evaluation of nomination files in the preliminary selection guarantees the most qualified candidates	36 27.7%	18 13.8%	38 29.2%	12 9.2%	26 20%	2.80	1.45
Q5-Introduce supplementary criteria for optimal preliminary selection of high-quality candidates	40 30.8%	16 12.3%	24 18.5%	24 18.5%	26 20%	2.84	1.52

Furthermore, approximately 30.7% of respondents supported the notion of exempting individuals with educational degrees from the preliminary selection process, while a majority, at 55.4%, found this exemption unacceptable. Moreover, a substantial portion of candidates, namely 51.5%, recognized the significance of the preliminary selection process in attracting high-quality candidates, while an opposing perspective was held by nearly a quarter, or 26.2%, of candidates. In terms of fairness, roughly 29.2% of preservice teachers perceived the preliminary selection process as fair, whereas 41.5% of respondents deemed it unfair.

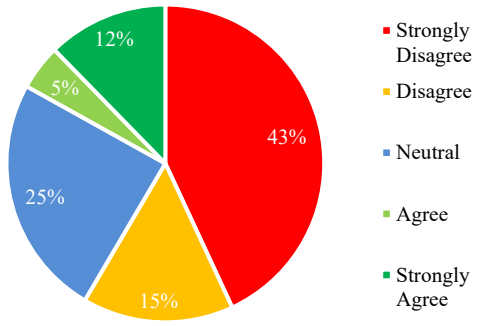

Figure 1. STEM teachers' perceptions on the effectiveness of the age criterion in selecting high quality candidates

These results indicate a clear division in opinions regarding the preliminary selection process, with significant concerns about its fairness and effectiveness in identifying suitable candidates. The Spearman's correlation analysis (Table 4) revealed significant relationships among perceptions of initial selection criteria.

A strong correlation (r=0.793, p<0.01) was found between subjecting nomination files to an initial selection and perceptions of fairness, indicating that participants who don't value preliminary selection view the criteria as unfair. Moderate correlations were observed between the age criterion and fairness perceptions (r=0.460 , p<0.01), suggesting that those who disagree with it view the process as unfair. Similarly, a moderate correlation was found between exempting education degree holders from initial selection and fairness (r=0.428, p < 0.01 r=0.428, p<0.01), implying that this criterion contributes in positive direction to the perceived fairness of the process.

Table 4. Heatmap of spearman's correlation analysis for likert scale items assessing initial selection criteria

	Q1	Q2	Q3	Q4	Q5
Q1	1	0,393	0,437	0,434	0,32
Q2	0,393	1	0,389	0,397	0,367
Q3	0,437	0,389	1	0,805	0,414
Q4	0,434	0,397	0,805	1	0,305
Q5	0,32	0,367	0,414	0,305	1

4.2. Written and Interview Stages

In this subsection, we delve into the key findings derived from the analysis presented in Table 5. The results from the table shed light on preservice STEM teachers' views on Written and Interview stages. According to the responses of 71% of prospective science educators, the delineation of content domains within the written examinations for the specialized subject matter was observed to be adhered to in the testing process (M=3.78, SD=1.20). Similarly, approximately 55.4% of respondents affirmed a congruence between the examination content and the prescribed Didactics and specialization subject, while only 18.4% expressed discordance with this notion. Furthermore, in the context of assessing the alignment of examination content with the course materials delivered at the university level, it was found that 66.2% of participants concurred that the specialization subject examination was aligned with the instructional content, whereas 20% held a contrary perspective.

Table 5. Views of preservice STEM teachers on the written and interview phases

Cronbach's Alpha	Number of items						
0.858	14						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
	Frequency and Percentage (%)						
Q6-Written exams for the specialization subject adhered to the content domains	8 6.2%	16 12.3%	14 10.8%	50 38.5%	42 32.5%	3.78	1.20
Q7-Written exams for Didactics and Educational Sciences adhered to content domains.	12 9.2%	12 9.2%	34 26.2%	40 30.8%	32 24.6%	3.52	1.22
Q8-Written Exams in the specialization subject match university teachings	2 1.5%	24 18.5%	18 13.5%	46 35.4%	40 30.8%	3.75	1.12
Q9-Written Exams in Didactics and Educational Sciences align with education degree teachings	10 26.3%	4 10.5%	8 21%	6 15.7%	10 26.3%	3.05	1.55
Q10-Overall, written exam timings were suitable	30 23.1%	16 12.3%	22 16.9%	32 24.6%	30 23.1%	3.12	1.48
Q11-Interview appointments for each candidate were respected	26 20%	10 7.7%	18 13.8%	30 23.1%	46 35.4%	3.46	1.52
Q12-Approximately two hours were allocated for preparing the practical scenario	20 15.4%	14 10.8%	16 12.3%	24 18.5%	56 43.1%	3.63	1.50
Q13-Adequate time was given for practical scenario preparation.	16 12.3%	22 16.9%	18 13.8%	24 18.5%	50 38.5%	3.53	1.45
Q14-The committee provided sufficient time for presenting the educational scenario	4 3.1%	8 6.2%	30 23.1%	26 20%	62 47.7%	4.03	1.11
Q15-Committee questions on the specialization subject align with bachelor's degree teachings	4 3.1%	10 7.7%	18 13.8%	38 29.2%	60 46.2%	4.07	1.08
Q16-Committee questions on Educational Sciences and Didactics align with bachelor's degree teachings	2 5.2%	2 5.2%	6 15.7%	6 15.7%	22 57.8%	4.15	1.19
Q17-Oral exam timings overall were appropriate	6 4.6%	14 10.8%	36 27.7%	32 24.6%	42 32.3%	3.69	1.16
Q18-The interview effectively assesses the candidate's teaching abilities	18 13.8%	12 9.2%	36 27.7%	38 29.2%	26 20%	3.32	1.28
Q19-The written exam predicts the candidate's teaching abilities in the specialization.	46 35.4%	36 27.7%	34 26.2%	10 7.7%	4 3.1%	2.15	1.08

Conversely, regarding the Didactics and educational sciences examination, 42% of individuals holding degrees in education expressed agreement with the alignment, while 36.8% disagreed. As illustrated in Figure 2, these findings indicate a general perception of alignment between the examinations and their respective curricula. However, discrepancies persist, particularly with the Didactics and Educational Sciences examination, suggesting that these areas may require further review and adjustments.

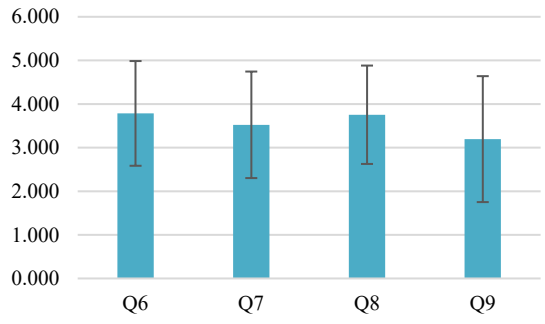

Figure 2. Means and standard deviations of responses on the alignment of written tests with content domain descriptions and university curriculum

In a broader perspective, a significant majority, 63.1% of respondents, maintained that the written examination phase falls short in its ability to evaluate and predict a candidate's aptitude for assuming the role of an educator, whereas only 10.8% espoused a contrasting viewpoint.

These results might suggest that the current examination format is perceived as inadequate for assessing teaching potential, highlighting the need for further exploration into written evaluation methods that better capture the practical skills and competencies required for effective teaching.

Regarding the organizational aspects of the interview phase, it is noteworthy that 49.2% of the respondents affirm the appropriateness of the scheduled timings for oral examinations, with only 15.4% holding a contrary perspective. Moreover, 48.5% assert that the appointments for candidates were fulfilled. A significant majority, constituting 61.6%, attests to the allocation of approximately 2 hours for the preparation of practical educational scenario, while 29.2% expressed dissent (M=3.63, SD=1.50). These findings suggest that while many respondents view the interview phase as well-organized, there are areas of concern, particularly regarding preparation time and appointment fulfillment, indicating potential for further improvement in the process.

Additionally, in terms of the sufficiency of time allotted for preparation, 57% of the respondents deem it satisfactory, whereas around 23% hold an opposing view (M=3.53, SD=1.45). During the interview phase, a substantial 67.7% of the respondents acknowledge that the committee afforded candidates ample time to present and engage in discussions regarding their practical educational scenario, while a mere 9.3% voiced a contrary perspective (M=4.03, SD=1.11).

Furthermore, an overwhelming majority, representing 75.4% of respondents, expressed satisfaction with the alignment of the committee's questions concerning the specialized scientific subject with the content taught at the university level (M=4.077, SD=1.19). Similarly, approximately 73.5% praised the alignment of questions in the domain of didactics and educational sciences (M=4.15, SD=1.16). In summation, the interview phase is perceived favorably by nearly half of the prospective science educators, with 49.2% considering it effective in predicting and assessing candidates' suitability for the role of a teacher, while 23% hold a contrary viewpoint (M=3.32, SD=1.28). As shown in Figure 3, In contrast to the written examination phase, which was largely criticized for its inability to predict teaching aptitude, the interview phase appears to be more favorably regarded, with nearly half of the respondents considering it effective in assessing candidates' suitability. However, like the written test, the interview process still shows room for improvement, as a notable percentage of respondents remain critical.

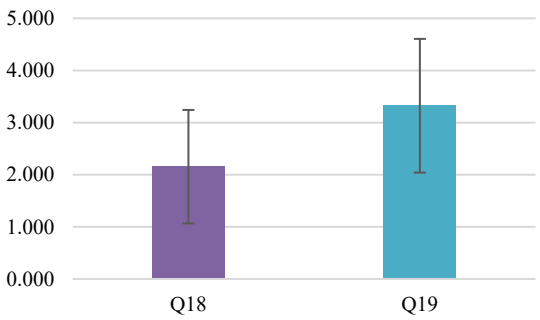

Figure 3. Means and standard deviations of responses on the effectivness of interviews and written tests

The Spearman's correlation analysis of the written and interview tests did not yield results directly relevant to addressing the research questions.

5. DISCUSSION

The preliminary selection process elicited notable responses from participants, with a significant majority expressing disagreement with the age-based criterion that limits candidacy to individuals under 30 years of age, leading them to perceive the overall process as unfair. This reflects widespread opposition to age discrimination, even among those who benefited by it. Such discrimination can have adverse economic implications, as highlighted by the UN in 2021, and negative societal consequences [18]. In response to similar issues, the U.S. Supreme Court requires that age-related job qualifications must be reasonably necessary and that most individuals above the age limit are unable to perform the job [19]. To date, no evidence supports the necessity of limiting entry to individuals under 30 in the field of education, nor is this criterion recognized as advantageous in the selection practices of high-quality education systems.

Regarding the exemption of individuals with prior educational degrees from the preliminary selection process, participants generally viewed this exemption as an influence to the fairness of the process. However, differing perspectives revealed a significant divide in opinions about whether prior educational qualifications should justify such exemptions. Similarly, perceptions of fairness in the preliminary selection process were also divided, reflecting multifaceted views influenced by individual experiences and academic backgrounds.

Notably, individuals holding bachelor's degrees expressed concerns about the fairness of the process, potentially stemming from the perception that academic performance despite their limited relevance to teaching effectiveness play an outsized role in selection. These findings suggest skepticism toward the grading system and its use as a basis for evaluating candidates' readiness for the teaching profession. Research shows that holding a certain graduate degree does not correlate with teaching effectiveness, particularly when measured through student outcomes [25]. This challenges the fairness of granting an advantage based on academic background alone.

A study by Aaronson, Barrow, and Sander further supports this, showing that non-classroom factors such as gender, race, teaching experience, university attended, advanced degrees, certification, and current tenure collectively explain less than 8% of teaching effectiveness [26]. To address these concerns, it is crucial that selection methods not only demonstrate reliability, validity, and fairness but are also perceived as equitable by applicants themselves [12]. This underscores the need for more egalitarian and transparent preliminary selection criteria to ensure fairness and inclusivity while maintaining the integrity of the process. The study's findings with respect to written examinations for specialized subject matter and education and didactics tests demonstrate a positive disposition towards the significant alignment of these assessments with the prescribed content descriptions. Notably, in Figure 2 a more pronounced alignment is observed in the case of the specialization test, suggesting a stronger cohesion with the subject matter.

Furthermore, a substantial alignment is noted between the examination test and the course materials offered by the university for the specialized subject matter. In contrast, there appears to be a comparatively lower degree of alignment for the educational and didactics test. This observation might echo the findings of Ouasri [14], highlighting a lack of institutional coordination at the organizational level within the educational landscape of Morocco. The divergence between the specialization subject matter and educational and didactics tests underscores the need for a more concerted effort towards enhancing coordination in the latter. These findings collectively suggest that while there is a noticeable alignment with specialized subject matter, the educational and didactics aspects may benefit from greater organizational focus and harmonization to enhance the overall quality of Written test. Despite the important efforts in the organizational aspect, a striking finding raised skepticism toward the written examination phase's

ability to effectively evaluate and predict a candidate's aptitude for assuming the role of an educator. A significant majority of respondents doubted its predictive power, highlighting a potential concern in the selection process. This represents a fundamental flaw in fulfilling the examination's core objective.

A recent study draw attention to the overemphasis on assessing factual knowledge as the primary indicator of teacher quality in high-stakes science assessments for teacher certification [21]. According to Osborne, this approach falls short in measuring preservice STEM teachers' understanding of authentic scientific practices and key goals outlined in the national standards in the United States [27]. These findings raise concerns about the potential exclusion of highly qualified candidates due to the lack of validity and predictability of the written test. Transitioning to the interview phase, the organizational aspects received mixed feedback. While almost half of the respondents found the scheduled timings for oral examinations appropriate, a notable proportion expressed dissent. But, in terms of time allocation for practical educational scenarios, the majority deemed it satisfactory.

This signifies that the process was generally going through adequate circumstances, except for the scheduling which might need further consideration, During the interview phase, the committee's approach received relatively positive feedback. A substantial percentage acknowledged that candidates were given ample time to present and engage in discussions regarding their practical educational scenario. A significant majority also expressed satisfaction with the alignment of the committee's questions with the content taught at the university level in both the specialized scientific subject and the domain of didactics and educational sciences. Which reveal that the interview phase was held professionally by the committee serving its purpose. the interview phase generally received more favorable evaluations than the written examination phase, demonstrating its perceived effectiveness in predicting and assessing candidates' suitability for the role of a teacher. As has been concluded in previous studies [28].

However, it's essential to note that a notable proportion held dissenting views, suggesting room for improvement in the selection process. Their dissatisfaction with certain aspects of the written examination phase and some few parts in the interview phase offer valuable insights for refining the teacher training program. These insights can be categorized as follows: When navigating the preliminary selection process, it's crucial to bear in mind the potential issues of age discrimination and adapt the process accordingly. To make informed decisions about candidates' ages, it's advisable to conduct thorough research within the Moroccan context.

Additionally, it's worth considering clearly exceptions for individuals holding degrees other than education. This can help streamline the selection process, allowing candidates to leverage their prior experiences or other relevant certifications to demonstrate their competency in the field of education to implement advanced strategies to foster student autonomy [36], motivation and deep understanding [37]. Furthermore, it's prudent to reevaluate and enhance the predictability and validity of the written test. This should begin with a comprehensive review of the test's content description. Lastly, the interview phase should be further developed to harness its strengths and establish precise guidelines for the committee. This will promote ongoing improvements and ensure that the process is shared and evolving effectively.

Recognizing the limitations of our research, which relied solely on quantitative methodology and was conducted using a questionnaire distributed in a single regional center, this study provides valuable insights while highlighting areas for further exploration. Future research should address these limitations by incorporating mixed methods and expanding to multiple regional centers for a more comprehensive understanding. Key areas of focus include age-inclusive policies, refining exemption criteria for non-education degrees, and assessing the predictive validity of selection tests. Additionally, exploring alternative teaching pathways, evaluating training program effectiveness, and conducting comparative studies with other countries can enhance science education selection processes in Morocco.

6. CONCLUSION AND RECOMMENDATION

This study provides valuable insights into the multifaceted stages of the selection process for preservice STEM teachers, identifying critical areas for improvement and opportunities to enhance its fairness and effectiveness. The findings reveal significant issues, including rigid age limits, divergent views on the exemption of individuals with certain academic background, and poorly aligned written exams, particularly in educational and didactics subjects. The skepticism surrounding the predictive validity of the written test raises concerns about the potential exclusion of highly qualified candidates, while the interview phase received more favorable evaluations, highlighting its potential as an effective tool for assessing candidates' suitability for the teaching profession.

To address these challenges, the written test content must be revised to include classroom-based scenarios and practical teaching simulations, ensuring better alignment with the realities of teaching. The widespread opposition to the age-based criterion underscores the need for its reconsideration, advocating for a selection process that prioritizes skills and competencies over arbitrary age restrictions. Similarly, the exemption of individuals with certain academic background unrelated to education warrants clearer and more transparent criteria that balance fairness with the specific demands of the teaching profession. Furthermore, the predictive validity of the written test should be enhanced through regular reviews and the integration of diverse assessment methods.

The interview phase, while positively regarded, requires further refinement to ensure consistency and fairness. Providing workshops for interview panels and

standardizing evaluation criteria will help reduce biases and enhance the reliability of the process. Establishing mechanisms for ongoing monitoring and feedback from candidates and committee members is crucial to ensure that the selection process remains aligned with educational objectives and the needs of the teaching profession. Finally, further research is needed to evaluate the long-term impact of revised selection criteria on the quality and performance of selected teachers, ensuring the process continues to evolve in alignment with best practices. By addressing these areas, the selection process for preservice STEM teachers in Morocco can be significantly improved, fostering a more equitable, transparent, and effective system that contributes to the development of a highly competent teaching workforce.

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BIOGRAPHIES

Name: **Youssef**
Surname: **Oulaydi**
Birthday: 02.07.1995
Birthplace: Khemisset, Morocco
Bachelor: Physics, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco 2018
Master: Teaching and Training Professions in Physics-Chemistry, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 2021
Doctorate: Student, Department of Physics, Faculty of Sciences, IbnTofail University, Kenitra, Morocco, Since 2022
The Last Scientific Position: Teacher, Mathematics, Middle Schools, Rabat/Sale/Kenitra, Morocco, Since 2019
Research Interests: Didactics, Educational Sciences, and Teaching and Training Professions in Mathematics and Experimental Sciences
Scientific Publications: 1 Paper, 2 Communications

Name: **Youssef**
Surname: **El Madhi**
Birthday: 22.08.1975
Birthplace: Kenitra, Morocco
Bachelor: Biology, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 1998
Master: Quality Control, Faculty of Sciences, Chouaib Doukkali University, El-Jadida, Morocco, 2000
Doctorate: Biology and Health, Faculty of Sciences, Ibn Tufail University, Kenitra, Morocco, 2006
The Last Scientific Position: Prof., Regional Center for Education Professions and Training (CRMEF), Rabat, Morocco, Since 2011 - Deputy Director in Charge of Continuing Education and Theoretical and Applied Pedagogical Scientific Research, CRMEF, Rabat-Sale-Kenitra, Morocco, Since 2021
Research Interests: Health, Biology, and Education
Scientific Publications: 40 Papers

Name: **Fatima Zahra**
Surname: **Guerss**
Birthday: 01.01.1984
Birthplace: Casablanca, Morocco
Bachelor: Computer Sciences, Mathematics and Informatics, Computer Department, Faculty of Sciences, Hassan II University, Casablanca, Morocco, 2007
Master: Mathematics and Computer Science, Hassan II University, Casablanca, Morocco, 2009
Doctorate: Computer Science, Faculty of Sciences and Technology in Mohammedia, Hassan II University, Casablanca, Morocco, 2018
The Last Scientific Position: Prof., Computer Science, Ibn Tofail University, Kenitra, Morocco, Since 2019
Research Interests: Sports, Education, Information andCommunication Technologies, E-Orientation, E-Guidance, Artificial Intelligence
Scientific Publications: 15 Papers, 1 Book, 3 Projects, 1 Thesis

Name: **Mouhcine**
Surname: **El Qryefy**
Birthday: 19.01.1987
Birthplace: Sidi Kacem, Morocco
Bachelor: Physical Sciences, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco 2008
Master: Teaching and Training of Physics-Chemistry, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 2017
Doctorate: Student, Department of Physics, Faculty of Sciences, IbnTofail University, Kenitra, Morocco, Since 2020
The Last Scientific Position: Teacher, Physics and Chemistry, Middle Schools, Academy Rabat/Sale/Kenitra, Morocco, Since 2012
Research Interests: Didactics, Educational Sciences, and Teaching and Training Professions in Mathematics and Experimental Sciences
Scientific Publications: 3 Communications

Name: **Zineb**
Surname: **Boumaaize**
Birthday: 11.09.1989
Birthplace: Kenitra, Morocco
Bachelor: Chemical Sciences, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco 2012
Master: Teaching and Training Physics-Chemistry, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 2017
Doctorate: Educational Sciences and Didactics, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 2023
The Last Scientific Position: French Teacher, Primary School, Rabat/Sale/Kenitra, Morocco, Since 2019
Research Interests: Didactics, Educational Sciences, Mental Health
Scientific Publications: 4 Papers, 2 Book Chapters, 10 Communications

Name: **Hajar**
Surname: **Darif**
Birthday: 25.08.1984
Birthplace: Kenitra, Morocco
Bachelor: Biology, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 2006
Master: Wastewater and Health, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco, 2008
Doctorate: Biology and Health, Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco in 2017
The Last Scientific Position: Assist. Prof., Higher School of Technology, Ibn Tofail University of Kenitra, Morocco, Since 2019
Research Interests: Environment and Health Studies
Scientific Publications: 11 Papers

Name: **Hanan**
Surname: **El Faylali**
Birthday: 18.01.1980
Birthplace: Kenitra, Morocco
Bachelor: Physical Sciences, Electronics Option, Faculty of Science, Abdelmalek Essaadi University, Tetouan, Morocco, 2004
Master: Microelectronics and Radio Frequency Techniques, Faculty of Science, Abdelmalek Essaadi University, Tetouan, Morocco, 2007
Doctorate: Telecommunication and Computer Sciences, Faculty of Sciences, Abdelmalek Essaadi, Tetouan, Morocco, 2012
The Last Scientific Position: Prof., Department of Physics, Sciences Faculty, Ibn Tofail University, Kenitra, Morocco, Since 2013
Research Interests: Modulization and Simulation of Wave Propagation, Optical Control of Microwave Circuits, Time-Domain Modeling of Antennas, TLM Analysis of Nonlinear Materials and Other Electromagnetic or Electronic Structures, Science Didactics
Scientific Publications: 34 Papers