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# Development and validation of School Mental Skills Assessment Scale (SMSAS)

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***Abstract****. Introduction.* Currently, the assessment of school mental skills is of practical interest. *Aim.* The present research *aims* to construct and validate a scale for assessing mental skills of schoolchildren. *Methodology and research methods.* The methodology was built using G. Churchill's paradigm (1979) adapted to the tasks of the study, which included four stages: building a list of elements; analysing the accuracy of the SMS message scale; analysing inter-factor correlations; and analysing the validity of the scale. To test the methodology based on emotional, cognitive and metacognitive strategies on a voluntary basis, the authors distributed the scale to 311 actors in the Moroccan education system: students, teachers, inspectors and trainers. *Results and scientific novelty.* The findings indicated that by utilising exploratory factor analysis (EFA), the authors uncovered three distinct factors that compose the school mental competency evaluation scale, resulting in a score of 79.416%. Additionally, when evaluating semantic consistency, the KMO index exceeded the suggested threshold of 0.70. Finally, the assessment of "internal consistency" and "coherence" was exemplified by a notably elevated Cronbach's alpha value of 0.848. *Practical significance.* The results obtained can be used as a tool for teachers and educationalists to assess school mental skills.

***Keywords:*** academic mental skills, scale, affective strategies, metacognitive skills, cognitive skills

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# Разработка и валидация шкалы оценки умственных навыков школьников

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***Аннотация.*** *Введение.* Вопросы оценки мыслительных способностей школьников представляют особый интерес, учитывая актуальность этой проблемы в настоящее время. *Целью* данного исследования является разработка и валидизация авторской шкалы для оценки мыслительных способностей школьников. *Методология и методы исследования.* Методология выстраивалась с использованием адаптированной под задачи исследования парадигмы Г. Черчилля (1979), включающей четыре этапа: построение списка элементов, анализа точности шкалы SMS-сообщений, анализа межфакторных корреляций и анализа валидности построения шкалы. Для апробации методики, основывающейся на эмоциональных, когнитивных и метакогнитивных стратегиях на добровольной основе были привлечены 311 представителей марокканской системы образования: учащихся, учителей, инспекторов и тренеров. *Результаты и научная новизна.* Результаты показали, что при использовании эксплораторного факторного анализа (EFA) были выявлены три отдельных фактора шкалы оценки мыслительных способностей школьников, что позволило получить достаточно высокий результат оценки в 79,416 %. Кроме того, при оценке семантической согласованности индекс KMO превысил предложенный порог в 0,70. Наконец, при оценке внутренней согласованности и когерентности значение альфа Кронбаха было существенно выше 0,848. *Практическая значимость.* Полученные результаты могут быть использованы в качестве инструмента для учителей и педагогов-теоретиков при оценке умственных способностей школьников.

***Ключевые слова:*** академические умственные навыки, шкала, аффективные стратегии, метакогнитивные навыки, когнитивные навыки

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# Desarrollo y validación de la Escala Evaluativa de Habilidades Mentales Escolares (SMSAS)

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***Abstracto.*** *Introducción.* Resultan de particular interés las cuestiones relativas a la evaluación de la capacidad de pensamiento de los escolares, dada la importancia de este problema en la actualidad. *Objetivo*. El propósito de este estudio es desarrollar y validar la escala diseñada por el autor para evaluar las habilidades de pensamiento de los escolares. *Metodología y métodos de investigación*. La metodología se construyó utilizando el paradigma de G. Churchill (1979) adaptado a los objetivos de la investigación, que incluyó cuatro etapas: construcción de una lista de elementos, análisis de la precisión de la escala de mensajes

SMS, análisis de correlaciones interfactoriales y análisis de la validez de la elaboración de la escala. Para probar la metodología, basada en estrategias emocionales, cognitivas y metacognitivas, se reclutó de forma voluntaria a 311 representantes del sistema educativo marroquí: estudiantes, profesores, inspectores y formadores. *Resultados y novedad científica*. Los resultados mostraron que mediante el análisis factorial exploratorio (AFE) se identificaron tres factores separados en la escala para evaluar la capacidad de pensamiento de los escolares, lo que permitió obtener un resultado de evaluación bastante alto del 79,416%. Además, al evaluar la coherencia semántica, el índice KMO superó el umbral propuesto de 0,70. Finalmente, al evaluar la consistencia y coherencia interna, el alfa de Cronbach fue significativamente superior a 0,848. *Significado práctico*. Los resultados obtenidos pueden utilizarse como herramienta para profesores y teóricos de la educación a la hora de evaluar las capacidades mentales de los escolares.

***Palabras clave***: habilidades mentales académicas; escala, estrategias afectivas, habilidades metacognitivas, habilidades cognitivas

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## Introduction

Nowadays, it is very important in education to make students the protagonists of the teaching-learning process [1]. The brain plays an important role because when the brain lobes are properly stimulated, students learn at a higher rate [2]. In the face of the increasing complexity of the modern educational system, the imperative to gain a profound understanding of students has become more crucial than ever before. The current challenges in education extend beyond mere knowledge transmission, encompassing the evaluation of cognitive, metacognitive, and even emotional and affective dimensions. This dynamic underscore the urgent need to develop robust and nuanced measurement instruments.

Questionnaires and scales for assessing scholastic skills distinguish themselves through their specific objectives in evaluating students' educational journeys. For instance, "the Learning and Study Strategies Inventory (LASSI)" offers an assessment of learning strategies, covering cognitive, metacognitive, emotional, and resource management aspects [3]. Nevertheless, the "Metacognitive Awareness Inventory (MAI)" focuses on understanding cognitive processes [4].

To evaluate motivation and learning strategies, the "Motivated Strategies for Learning Questionnaire (MSLQ)" is used [5]. The "Situational Cognitive Engagement Measurements (SCEM)", in contrast, concentrates on certain aspects of student engagement, like effort and experiences [4]. To evaluate students' emotions and self-esteem, the "FEEL-KJ" and "SPPA" are utilised [5]. Together, these assessment tools offer a detailed understanding of key elements of academic accomplishment, such as learning strategies, motivation, and engagement, making it possible to evaluate students' academic development in depth.

The objective of this study is to construct and validate a scale assessing the scholastic mental skills of Moroccan students. It aims to optimise learning strategies, improve academic grades, as well as assess progress and identify shortcomings in the strategies adopted by students.

For methodological and epistemological reasons, we will attempt to specify school mental skills. In addition, the aim is to develop and validate a scale assessing the academic mental skills of Moroccan pupils.

This research aims to answer two questions

- What dimensions of mental competency can be captured by an endorsement scale?

- What are the metric characteristics of validity and fidelity of a scale measuring mental competencies according to Churchil's validation model?

## Literature Review

J. Vaculková [6] conducted research that was primarily focused on validating the MSLQ, an assessment tool that P. Pintrich, D. Smith et al. [7] first created. The Chinese adaption of the MSLQ, on the other hand, is classified as a self-regulated learning instrument with a single factor, according to alternative research [8]. A latent factor structure unique from the original MSLQ has also been found in research that examined the psychometric attributes of the MSLQ-CV in a comparable cultural environment in Hong Kong [8].

Other research has explored the adaptation of the English version of the Learning Strategies Scale (LSS) by P. Warr and J. Downing [9], analysing its factorial structure and psychometric properties. Additionally, its concurrent validity has been assessed by testing the relationship between LSS and transfer in a learning context [10]. Similarly, a project to validate a questionnaire of learning strategies was undertaken by L. H. França et al. [11], based on the classification by N. J. Cabrera et al. [12].

Certainly, researchers and professionals set themselves apart through the use of metrics and factors for assessing learning approaches. Nevertheless, these metrics are contingent on the situation, influenced by culture, and tailored to the individual, which can invite criticism concerning the psychometric attributes, credibility, and consistency of the tool. While it is important to acknowledge that measurement instruments utilise various techniques, the key factor involving expert opinions and their role in validating these tools remains a prevalent and crucial aspect in nearly all studies within this field.

G. Churchill's model [13], advocating for the construction of measurement scales by refining items based on survey data rather than specifying them a priori, proves particularly suitable for developing original scales when a priori specification is not feasible. Nevertheless, validation models for measurement instruments have faced criticisms. One frequent criticism is their tendency to reduce complex concepts to a limited number of measurable dimensions [14]. Additionally, reliance on often limited participant samples may restrict the generalisability of results, although cross-validation can partially mitigate this limitation [15].

## Methodology

We adopted the approach proposed by G. Churchill [13] in four stages:

- Step 1: Construction of the item corpus.

- Step 2: Analysis of SMSAS scale fidelity.
- Step 3: Analysis of inter-factorial correlations.
- Step 4: Analysis of the scale construct validity.

### *1. Construction of the Item Corpus*

As a first step, we undertook an in-depth literature review to explore the evolution of research on academic mental skills. This step enabled us to identify an initial list of 101 raw items.

We then sought the advice of five experts in the field of education, whose experience ranged from 3 to 30 years. This group of experts included a teacher-researcher, a CRMEF trainer, a pedagogical inspector, a pedagogical advisor and a secondary school teacher.

To assess the relevance of the raw items, we presented them in the form of a simple questionnaire, comprising nominal questions. The aim was to ask each expert to rate them on a Likert scale to determine their validity in measuring school mental skills. In addition, they were asked to modify the wording or even propose other items.

The scores obtained for each item enabled us to eliminate 30 items whose total score was lower than Total mean of all items – 1 Standard deviation, which represents 34% according to the Guassien law. In the end, this gave us a final number of 71 items.

### *2. Administration of the First Version of the Scale*

We developed the 1st form of the scale, based on 71 items obtained, with an introduction to the scale and assessment procedures based on a 4-level Likert scale, and with specific instructions to better respond to the formulated statements. We have named it the School Mental Skills Assessment Scale (SMSAS).

This SMSAS scale was pre-tested with 5 teachers and 10 secondary school students to ensure clarity and comprehension of the statements. This step enabled us to check whether the statements were well understood by the participants, leading to some modifications in the wording of some of them.

In this 1st version, the SMSAS scale was administered to 311 players in the field of education: 124 students (47.86% secondary school students and 52.13% high school students) from the Casablanca-Settat region, 75 inspectors, 16 teacher trainers and 96 teachers. The survey was administered both face-to-face and remotely, so we confirmed the anonymity of respondents' answers.

### *3. Methods for Analysing the Results of the First Version of the SMSAS Scale*

**Exploratory factor analysis (EFA) of the SMSAS scale**

To investigate the composition of the School Mental Skills Academic Scale, we conducted an "exploratory factor analysis (EFA)". This approach aligns with the methodology employed by A. E. Hurley et al. and is acknowledged as suitable for

assessing scales that are in the developmental stage, as established by A. E. Hurley et al. [16].

Without relying on preset dimensions, we were able to use EFA to evaluate the factor structure from 311 individuals data collected. The following statistical criteria were used in this analysis:

In accordance with C. Acal et al. [17], we used the "Maximum Likelihood" extraction method with Varimax axis rotation while accounting for mild inter-factor correlations. We kept every factor that had an eigenvalue greater than 1, which denotes that it contributes at least 50% of the variance.

- We assessed the correlation matrix determinant as well as the KMO (Kaiser-Meyer-Olkin) index. Following the recommendations provided by J. Bourque et al. [18], these two metrics helped to discover patterns of correlation among the items within the scale that needed to be validated.

- Items with a saturation coefficient exceeding 0.40 were retained as part of the factor.

### *4. SMSAS Fidelity Analysis Method*

We used the Split-Half approach, as advised by J. C. Nunnally [19], to assess the scale internal consistency. It is generally agreed that achieving an internal consistency value of 0.7 or higher, as determined by Cronbach's alpha coefficient, is highly excellent. We next removed items with "Skewness and Kurtosis coefficients" greater than 1, as well as those with an Exploratory Factor Analysis (EFA) saturation level less than 0.4, and reviewed the same metrics.

## Results

### *1. Reliability Analysis of the SMSAS Scale*

We examined internal consistency and internal coherence before and after the EFA, the results of which are presented in the table. The initial set of items analysed consisted of 71 items.

Cronbach's alpha indicator of internal consistency increased from 0.744 to 0.848 after the removal of 11 entries. The correlation coefficient, which measures internal consistency, also increased from 0.729 to 0.772. The computation of Cronbach's alpha for the three subcomponents greatly exceeded the cutoff of 0.70, as stated by J. C. Nunnally [19], after the "Exploratory Factor Analysis (EFA)". Additionally, according to some academics, a strong internal consistency is indicated by an alpha of 0.80 or above by R. A. Peterson [20].

As a result, eleven additional items that were not retained were also eliminated because their factor loading in the EFA was less than 0.4 [21]. The following table illustrates these results.

Table 1

Internal consistency and coherence characteristics of the SMSAS scale

| Subscale | Code | Items numbers | | | Correlation between two parts[b] | | Cronbach alpha[c] | |
|---|---|---|---|---|---|---|---|---|
| | | Raw items | Deleted items[a] | Retained items | Before | After | Before | After |
| Affective strategies | AS | 32 | 7 | 25 | ,966 | ,970 | ,756 | ,861 |
| Cognitive strategies | CS | 26 | 3 | 23 | ,933 | ,935 | ,708 | ,852 |
| Metacognitive strategies | MS | 13 | 1 | 12 | ,901 | ,946 | ,723 | ,847 |
| *Scale* | *EECMS* | *71* | *11* | *60* | *,729* | *,772* | *,744* | *,848* |

*Note.* a. Items eliminated outside the ±1 range of the coefficient of asymmetry and symmetry or the coefficient of saturation below 0.4 in the EFA

b. Internal consistency coefficient.

c. Internal consistency coefficient.

### *2. Exploratory Factor Analysis*

The KMO (Kaiser-Meyer-Olkin) index evaluation and the factor affecting the correlation matrix are shown in the table, with a resultant score of 0.813. This result significantly surpasses the recommended cutoff point of 0.70. As a result, our goods have strong association patterns that are easy to see. The correlation matrix (DMC) determinant registers as zero, which is within the expected range.

Rotations were carried out, as is customary in factor analysis. The Kaiser, Meyer, and Olkin (KMO) test and Bartlett's sphericity test are frequently used to assess if factor analysis is acceptable. The Kaiser-Meyer-Olkin (KMO) test result for our scale is 0.813, and the Bartlett's sphericity test result is 2485.

Table 2

The resulting factor structure ("Kaiser-Meyer-Olkin index and Bartlett test")

| Indices | | SMSAS |
|---|---|---|
| Kaiser-Meyer-Olkin index for measuring sampling quality | | ,813 |
| Bartlett's sphericity test | Khi-carré approx. | 6716,269 |
| | ddl | 2485 |
| | Signification | ,000 |

Our funding from the "exploratory factor analysis (EFA)" involving the 60 items revealed the presence of three factors within the skills scale, each with eigenvalues surpassing 1, as described by H. F. Kaiser [21]. These three factors collectively account for 79.416% of the total variance, which is moderately substantial, considering that their eigenvalues exceed 1. Consequently, the factor matrix, as depicted in the following table, summarises the factor loadings for each item.

Hence, the results indicated, following the initial factor analysis, the presence of three factors and the identification of six items that require rephrasing or elimi-

nation, given their variance values exceeding 1, along with the removal of indicators (items) with factor loadings below 0.4 (< 0.4 in the component matrix).

To enhance and validate our measurement scale, we conducted a second round of data collection. During this process, we performed a Principal Component Analysis (PCA) on the same set of items, resulting in the identification of 45 items, while 15 items were eliminated through factor analysis.

Factor 1 accounts for 35.296% of the total variance and consists of 20 items assessing: Self-Critique; Self-Critique Acceptance; Autonomy; Defiance; Emotion Management; Organisation; Communication/Boldness; Self-Confidence; Curiosity; Determination; Motivation; Pleasure in Work, and Confidence at School. This factor corresponds to affective strategies.

Factor 2 represents a percentage of 26.472% of the total variance and consists of 15 items related to the following skills: Understanding; Concentration; Distinction; Reading-Listening; Memorisation; Note-taking; Problem Solving, and Efficiency. This factor corresponds to cognitive strategies.

Factor 3, accounting for a total variance of 17.648%, consists of 10 items assessing: Analysis and Inhibition. These are metacognitive strategies.

Table 3

Factor matrix after scale rotations and total variance explained for each factor

| Item abbreviations | 3 dimensions explaining 79.416% | | |
|---|---|---|---|
| | Affective strategies | Cognitive strategies | Metacognitive strategies |
| Variances explained | 35,296% | 26,472% | 17,648% |
| SA10 | ,759 | | |
| SA16 | ,744 | | |
| SA31 | ,740 | | |
| SA25 | ,739 | | |
| SA19 | ,729 | | |
| SA13 | ,727 | | |
| SA02 | ,724 | | |
| SA22 | ,707 | | |
| SA26 | ,704 | | |
| SA14 | ,701 | | |
| SA04 | ,694 | | |
| SA05 | ,689 | | |
| SA27 | ,689 | | |
| SA30 | ,687 | | |
| SA09 | ,686 | | |
| SA20 | ,685 | | |
| SA12 | ,679 | | |
| SA03 | ,669 | | |
| SA18 | ,660 | | |
| SA23 | ,658 | | |
| SC57 | | ,829 | |
| SC49 | | ,814 | |
| SC45 | | ,813 | |
| SC47 | | ,805 | |
| SC43 | | ,798 | |
| SC39 | | ,797 | |
| SC33 | | ,793 | |

| | | | |
|---|---|---|---|
| SC54 | | ,763 | |
| SC35 | | ,762 | |
| SC41 | | ,756 | |
| SC37 | | ,755 | |
| SC58 | | ,748 | |
| SC56 | | ,694 | |
| SC51 | | ,692 | |
| SC48 | | ,660 | |
| SM67 | | | ,810 |
| SM66 | | | ,798 |
| SM68 | | | ,794 |
| SM61 | | | ,789 |
| SM63 | | | ,784 |
| SM59 | | | ,778 |
| SM65 | | | ,778 |
| SM71 | | | ,774 |
| SM62 | | | ,772 |
| SM60 | | | ,771 |
| %Cumulative variance | 39,188% | 61,091% | 69,416% |

*Note.* Item abbreviations.

SA10: I trust the skills of the majority of teachers and their teaching methods. SA16: I spend time (1 to 2 hours) every evening revising lessons (either alone or in extra classes) despite constraints. SA31: I take pleasure in studying and going to school. SA25: I am motivated to engage in classroom work in all subjects. SA19: I am constantly anxious and worried about failing in my studies. SA13: I am always curious to learn more about course-related knowledge. SA02: I know my limits and areas of knowledge deficiency for each subject. SA22: During exams, I easily panic when I cannot answer certain questions. SA26: I am motivated to attend extra classes or do additional work. SA14: I feel challenged to have my grades among the best in the class or school. SA04: I am independent: I organise my schedule and do not need others or extra classes to improve. SA05: When I feel stuck, I tend to increase my efforts without seeking help from others. SA27: I am motivated to revise lessons every evening and during weekends. SA30: I take care of my school belongings (bags, documents, notebooks, pencil case, arrangements, etc.). SA09: I have confidence in the future of my studies. SA20: I have the ability to overcome the fear of exams and assessments. SA12: I have the ability to overcome the fear of exams and assessments. SA03: I accept feedback from others on my school behaviour (revision, class, homework, etc.). SA18: I have a high determination to achieve a specific ambition at the end of my studies. SA28: I am interested in all subjects. SC57: During preparation, I practice exercises, solve problems, and write essays. SC49: During the preparation period for assessments, I repeat course materials several times (exercises, texts, formulas, etc.) to memorise them. SC45: Listen carefully to explanations given by the teacher. SC47: Read exam questions carefully and accurately. SC43: My average grade is out of 5. SC39: During exams or assessments, I don not miss any details in reading questions (I do not overlook or ignore certain information in the questions). SC33: Understand explanations, words, logical connections, and questions given in class. SC54: During exams, I sometimes forget knowledge I have

learned or have memory lapses. SC35: Understand exam questions, explanations given, words, and logical connections. SC41: Practice distinguishing information given in class by the teacher: explanations, advice, questions. SC37: Concentrate during revision sessions. SC58: In class, we practice exercises, solve problems, and write essays as exam simulations. SC56: During the revision period, I rewrite my class notes and summarise the lesson. SC51: I start my revisions with (without, day before, 3 days, 1 week, 2 weeks, 1 month, 2 months). SC48: Memorise in class in different subjects. SM67: During preparation, I dedicate a certain amount of time to work per day. SM66: During exams, I manage time in relation to the questions asked. SM68: I take my time to think before answering questions. SM61: In class, I have the ability to block distractions during lessons (phones, discussions, whispers and laughter among classmates, negative thoughts and internal thoughts, etc.). SM63: I question the effectiveness of my exam preparation strategies. SM59: I have the ability to analyse and synthesise knowledge. SM65: During preparation, I create a revision schedule for exam subjects. SM71: I constantly think about varying my preparation method (in case of errors and limitations). SM62: During exams, I have the ability to block distractions (phones, discussions, whispers and laughter among classmates, negative thoughts and internal thoughts, etc.). SM60: I have the ability to block distractions during revision (phones, music, discussion, TV shows, negative thoughts and internal thoughts, etc.).

### *3. Inter-Factor Correlation Analysis*

The relationships between the three scale factors are shown in the table. Three significant coefficients totaling 100% were found among the three estimated correlations, although having very low strengths.

Table 4

Correlation matrix between SMSAS factors expressed in terms of Bravais-Pearson coefficient

| Factors of the scale | | Affective strategies | Cognitive strategies | Metacognitive strategies |
|---|---|---|---|---|
| Affective strategies | Pearson correlation | 1 | | |
| | Sig. (two-tailed) | | | |
| Cognitive strategies | Pearson correlation | ,211* | 1 | |
| | Sig. (two-tailed) | ,019 | | |
| Metacognitive strategies | Pearson correlation | ,267** | ,301** | 1 |
| | Sig. (two-tailed) | ,003 | ,001 | |

*Note.* *. Correlation is significant at the 0.05 level (two-tailed).

**. Correlation is significant at the 0.01 level (two-tailed).

### *4. Conceptual Validity of the Scale Analysis*

We finalised our research methodology to validate the existence of the three dimensions we have identified. For each factor, we established a theoretical foundation grounded in previous research and literature reviews.

Table 5

Analyses of the scale construct validity across studies

| N | Factors | Authors/studies |
|---|---|---|
| 1 | Affective strategies | C. Weinstein and R. Mayer [22] state that affective strategies help develop attention, maintain focus, manage anxiety and optimise motivation. |
| 2 | Cognitive strategies | M. Hrimech [23] indicates that the ability to reproduce what was seen in class or to simply recite a poem is guaranteed by the strategies of memorisation or repetition whether they are considered to be of a cognitive nature |
| 3 | Metacognitive strategies | In a given context, G. Schraw notes that self-knowledge or task knowledge are considered as metacognitive aspects that the learner develops through the use of different strategies [24]. |

## Discussion

In this research, our objective was to construct and validate a tool for evaluating school mental skills in the Moroccan context. This tool encompasses cognitive, metacognitive, and affective dimensions that students develop, organise, and use to address various problem-solving situations. Our methodological approach was based on the classical scale validation theory, following G. Churchill's paradigm [13]. We referred to several studies that utilised this theory in various fields, including education [25–28].

The study consisted of two main parts: first, the extraction of indicators or items related to school mental skills through a literature review, which were then transformed into a questionnaire and reviewed by experts in the field of education. Second, a rigorous statistical analysis of the collected data was conducted following the four steps outlined by G. Churchill [13].

We created the first version of the School Mental Skills Assessment Scale (SMSAS) with 71 items. This scale underwent a pretest phase involving 5 teachers and 10 secondary school students to ensure the clarity of the statements, leading to some adjustments in their formulation. Subsequently, it was administered to 311 participants in the field of education, including 124 secondary school students, 75 inspectors, 16 trainers, and 96 teachers.

Despite the fact that our methodological approach closely adhered to the steps and guidelines for creating and verifying assessment tools, it did not cover all the components necessary for understanding school capabilities. Some of these elements are difficult to isolate because they are difficult to measure, evaluate, or articulate.

Upon analysing reliability and validity indices, an exploratory factor analysis identified three factors comprising the School Mental Skills Evaluation Scale (SMSES). These factors accounted for 79.416% of the variance, representing an acceptable and moderately robust proposition.

The Kaiser-Meyer-Olkin index also offered a positive value for semantic consistency, exceeding the suggested cutoff point of 0.70. Additionally, the examination of internal consistency and coherence was carried out using Cronbach's alpha, which

revealed a significant value of 0.848, which is regarded as strong by J. C. Nunnally's [19] standards.

In general, the results of our conducted tests showcased favorable psychometric properties. Additionally, the various tools employed for validating school mental skills in our study, including the analysis of inter-factor correlations and construct validity, displayed acceptable factor loadings and significant adequacy indices.

As a result of this extensive process of developing and validating the measurement scale for school mental skills, our study identified a final set of 45 items measuring three factors: cognitive dimensions (15 items), metacognitive dimensions (10 items), and affective dimensions (20 items). We subsequently delve into the dimensions of school skills in the literature, highlighting various research studies in this regard.

Cognitive skills have a significant impact on the learning process. These skills cover complex cognitive functions that are necessary for solving problems and assimilating new information. According to P. A. Alexander and P. K. Murphy [26], the ability to perceive, analyse, and integrate information is improved in children who have highly developed cognitive abilities. These abilities foster critical and analytical thinking, empowering students to critically evaluate data and reach well-informed conclusions. Such abilities are especially important in a constantly changing world where the ability to learn new information and adapt to shifting conditions is crucial [29].

Regarding the development of metacognitive skills, research indicates that learning tasks must be stimulating and rewarding enough for students to use metacognitive skills specifically. This implies that applying metacognitive knowledge only benefits when the learning task falls within a subjectively moderate difficulty range [30], which is advantageous for teachers. While designing the same testing method for all intermediate-level students may seem like an incredible burden for teachers, modern paradigms of individualised education support this notion. We need to know what strategies students use and to what extent they can generalise under the influence of metacognitive and associative processes.

To sum up, the goal of our study was to add to the body of evidence already available about the validity of school skill assessments. The data gathered for this study can provide practitioners and educators in the field of education with insightful information. According to M. Altet [28], in order to effectively teach, one must have a thorough grasp of the emotional and cognitive needs of their students. This understanding is becoming increasingly important for directing and improving teaching techniques, which will ultimately lead to increased student learning.

The introduction of affective skills was pioneered by C. Weinstein and R. Mayer [22], who emphasised their profoundly beneficial effects on sustaining students' attention and focus, controlling anxiety and stress, and boosting motivation. These elements work together to include students' cognitive processes in the learning and skill-building process.

Several studies have emphasised the relationship between motivation and affective strategies from a socio-cognitive perspective [31]. Indeed, students' perceptions (of knowledge, tasks, etc.) and conceptions (of goals, school) implicitly guide their motivation, particularly in interaction with their environment. Consequently, these indicators enable students to have cognitive engagement, allowing them to apply various learning strategies, which, in turn, creates an "active agent", who deliberately participates in all stages of their learning [32]. Although categories of affective skills are not uniform among theorists and researchers, there are also significant differences in identifying the skills associated with them. F. Ruph [33] concludes that emotional management actions are effective in keeping students motivated and focused.

The act of teaching and learning is a complex system that requires the involvement of a range of factors, both internal and external, to contribute to success. Success is defined as providing quality education that enables students to develop the necessary skills and equip themselves to better address any problem situation. The establishment of relevant, validated, and reliable measurement instruments specific to the cognitive, metacognitive, and affective aspects of the student represents an effort that allows the educational practitioner to possess a tool that enables the assessment of students' school behaviour before, during, and after a learning activity, and also facilitates reflective feedback on these methods in order to adapt them to the needs of their students.

Through this research, we attempted to design and validate a measurement scale for school skills, preceded by a literature review of studies focusing on learning strategies. G. Churchill's [13] paradigm served as our framework for this validation project, and we rigorously followed the four stages of measurement tool validation.

## Limitations

Despite the obtained results and the thorough adherence to G. Churchill's [13] methodology, some limitations in our research appear to be worth mentioning. Indeed, our study was able to identify a set of indicators and criteria for school skills. It would be advisable to consider the perceptions of skills by teachers or even by their students, or to model these skills in terms of school subjects, which would be a suggestion for future research.

In addition to this, the assessment of competence in education lacks consensus in the research by E. Fé, D. Gill and V. Prowse [34], hence the interest in discussing the concept of learning strategies that also encompass the affective, cognitive, and metacognitive dimensions related to learning. This sensitivity of the competence concept thus requires a preliminary qualitative study to analyse students' school behaviour [11]. Similarly, the focus should be placed on teaching practices and the representation of school skills for primary teachers and how they approach their classes [35].

## Conclusion

The teaching-learning act is a complex system that requires the intervention of a set of factors (internal and external) to contribute to its success. Success is in terms of quality teaching that allows the learner to develop the necessary skills and tools to better act in any problem situation.

The implementation of relevant, validated and reliable measurement instruments specific to the affective, cognitive and metacognitive aspects of the learner constitutes an effort allowing the pedagogical intervener to equip himself/herself with a tool that will allow him/her to appreciate the student's academic behaviour before, during and after a learning activity and also to have reflexive feedback on these methods in order to adapt them according to the needs of the learners.

Through this research, we tried to design and validate a scale for measuring academic skills, preceded by a bibliographic study of studies on learning strategies. G. Churchill's paradigm [13] was our frame of reference for this validation project, in which we rigorously followed the four steps of validation of a measurement tool. The statistical approach we used produced encouraging outcomes, indicating rather acceptable psychometric properties. This instrument also stands out for having great internal consistency and a high enough level of temporal stability

In conclusion, our study constitutes an initialisation to the evaluation of school competences in the Moroccan context where the subject of teaching and learning occupies a practical interest in the great authorities of the country. Our part of originality constitutes in the fact that we evoked the affective dimension which was not taken into account in the existing measurement tools in the literature or treated in a distinct way. Nevertheless, we must not forget that the validation of a measurement scale depends imperatively on its context of use.

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