

From Knowledge to Practice: Assessing Adolescent Learners' Nutrition Literacy and Its Determinants in South African Schools

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Abstract

Adolescence is a critical period for establishing lifelong dietary habits (World Health Organization, 2018). School-based Nutrition Education (NE) is a key strategy for improving nutritional knowledge. However, the effectiveness of such education in low- and middle-income countries like South Africa, with its persistent double burden of malnutrition, requires continuous evaluation. This study assessed the level and nature of nutrition knowledge among high school learners and explored its association with grade level, subject exposure, and food group awareness. A cross-sectional survey was conducted with 60 Grade 10–12 learners (50% male, 50% female) from three schools in the Thabo Mofutsanyane District, South Africa. Data were collected using a structured questionnaire, capturing familiarity with core nutritional concepts and exposure to NE. Descriptive statistics (frequencies, percentages, means, standard deviations) and chi-square tests were used for analysis, framed within the Knowledge component of the Knowledge-Attitude-Practice (KAP) model and the theory of planned behaviour. Learners demonstrated high familiarity with the benefits of fruits and vegetables (mean = 4.5 ± 0.7) and risks of excessive fat (mean = 4.2 ± 1.0), but significantly lower knowledge regarding the risks of high carbohydrate consumption (mean = 2.7 ± 1.4). While 83.3% reported receiving NE, exposure was highest in Grade 10 (35%) and primarily through Natural Science and Technology (45%) and Life Sciences (35%). Awareness was universal for fruits & vegetables (100%) but lower for carbohydrates (60%). Learners possess uneven nutrition literacy, with identifiable gaps in understanding macronutrients like carbohydrates. NE delivery is fragmented across subjects and grades. To bridge the knowledge-practice gap, a more structured, comprehensive, and contextually relevant NE curriculum, potentially with standalone status, is recommended to empower adolescents to make informed dietary choices.

Keywords: nutrition education, nutrition literacy, adolescents, knowledge-attitude-practice (KAP) model, TPB, South Africa, school health

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Introduction

Adolescence is a formative educational and developmental stage characterised by rapid physical growth, cognitive advancement, and the establishment of lifelong health behaviours. During this period, nutrition plays a pivotal role not only in physical wellbeing but also in learning capacity, school engagement, and long-term health trajectories (World Health Organization, 2018). From a curriculum design perspective, adolescence presents a critical opportunity for structured, developmentally appropriate nutrition education that can equip learners with the knowledge and competencies necessary to make informed dietary choices.

In South Africa, adolescent nutrition occurs within a complex epidemiological and educational landscape. Persistent undernutrition and micronutrient deficiencies coexist with increasing rates of overweight and obesity, reflecting the “double burden of malnutrition” (Sedibe et al., 2018; Shisana et al., 2013). Addressing this dual challenge requires more than health sector interventions alone; it demands coherent and effective curriculum design that integrates nutrition literacy as a foundational life skill within schooling.

Globally, school-based nutrition education is recognised as a key curricular strategy for enhancing nutrition knowledge, shaping positive health attitudes, and supporting healthy dietary practices among young people (Contento, 2011; Dudley et al., 2015). In South Africa, however, nutrition education is not formalised as a standalone subject. Instead, it is dispersed across multiple subjects—Life Orientation, Natural Sciences and Technology, and Life Sciences—within the Curriculum and Assessment Policy Statement (CAPS) framework (Department of Basic Education, 2011). Complementing this curricular approach, the National School Nutrition Programme (NSNP) seeks to link school feeding with nutrition education to improve both learner health and educational outcomes (Kupolati et al., 2015).

Despite these curriculum and policy commitments, concerns persist regarding the coherence, depth, and pedagogical effectiveness of the integrated nutrition education model. Diffusion of nutrition content across subjects may result in fragmented coverage, limited progression across grades, and inconsistent emphasis, depending on subject priorities and teacher expertise. Furthermore, educators responsible for delivering nutrition-related content often lack specialised training in nutrition science, raising questions about curricular fidelity, accuracy, and learner engagement (Nguyen et al., 2017; Ronto et al., 2017). These challenges highlight the need for empirical evidence to inform curriculum review and development processes.

The Knowledge–Attitude–Practice (KAP) model provides a useful conceptual lens for examining curriculum effectiveness, particularly in health education. The model posits that knowledge acquisition forms the foundation upon which attitudes are shaped and behaviours adopted (Launiala, 2009). From a curriculum development standpoint, assessing learners’ nutrition knowledge is therefore a critical first step in evaluating whether existing curricular intentions translate into meaningful educational outcomes. While prior research has focused largely on teachers’ experiences of delivering nutrition education, there remains limited, context-specific evidence on learner-level nutrition knowledge in South African secondary schools.

This study is guided by the Theory of Planned Behaviour (TPB) proposed by Ajzen (1991), which provides a robust framework for understanding the relationship between knowledge and behaviour. The TPB posits that an individual’s behaviour is primarily determined by their

behavioural intention, which in turn is influenced by three key constructs: attitudes, subjective norms, and perceived behavioural control.

In the context of adolescent nutrition, attitudes refer to learners' beliefs about healthy eating and the perceived benefits or disadvantages of consuming nutritious foods. Positive attitudes towards healthy diets are expected to increase the likelihood of forming intentions to adopt healthy eating behaviours. Subjective norms capture the perceived social pressures from peers, family members, teachers, and the broader school environment that influence adolescents' dietary choices. In school settings, social influences are particularly important as adolescents are highly responsive to peer behaviours and expectations.

Perceived behavioural control (PBC) reflects learners' perceived ability to make healthy food choices, considering factors such as accessibility, affordability of nutritious foods, and self-efficacy. In the South African context, structural constraints—including school food environments and socio-economic conditions—may significantly shape this construct. According to TPB, PBC not only influences behavioural intention but can also directly affect actual behaviour.

While TPB does not explicitly incorporate knowledge, this study integrates nutrition literacy as a foundational determinant that shapes the core constructs of the theory. Nutrition literacy is conceptualised as adolescents' ability to obtain, understand, and apply nutrition information to make informed dietary decisions. Higher levels of nutrition literacy are expected to promote more favourable attitudes towards healthy eating, strengthen perceived behavioural control, and positively influence behavioural intentions.

Thus, within this study, nutrition literacy operates as an upstream predictor, influencing attitudes, subjective norms, and perceived behavioural control, which subsequently shape behavioural intentions and ultimately dietary practices. This framework enables a comprehensive analysis of how knowledge translates into practice among adolescent learners.

By applying TPB in the South African school context, this study provides insights into both individual-level cognitive determinants and broader social and environmental influences that affect adolescents' nutrition behaviours. The framework therefore supports the identification of key intervention points for improving dietary practices among learners.

Against this backdrop, this study aimed to assess the nutrition literacy of adolescent learners in a selected district of the Free State Province, South Africa, with specific reference to curriculum exposure and learning outcomes. The objectives were to:

1. Determine the level and nature of nutrition knowledge among a sample of high school learners; and
2. Examine associations between nutrition knowledge, grade level, subject-based exposure to nutrition content, and awareness of food groups.

By generating learner-centred evidence, the study seeks to contribute to ongoing debates on curriculum design, sequencing, and development of more coherent and responsive nutrition education within the secondary school curriculum.

Methods

Study Design and Setting

The study employed a quantitative, descriptive cross-sectional survey design to examine learner-related factors relevant to the design, development, and implementation of the Life Sciences curriculum at secondary school level. This design was appropriate for capturing learners' perspectives at a single point in time, thereby generating empirical evidence that can inform curriculum review, alignment, and improvement within the Further Education and Training (FET) phase.

The research was conducted in three public secondary schools located in the Nketoana Municipality, Thabo Mofutsanyane District, Free State Province, South Africa. These schools operate within predominantly rural and semi-rural contexts, where curriculum design decisions, resource availability, and pedagogical practices have a direct impact on learner engagement and curriculum effectiveness. The setting therefore offered a relevant context for investigating curriculum-related issues within authentic schooling environments.

Population and Sampling

The target population consisted of adolescent learners enrolled in Grades 10–12 and registered for Life Sciences, a core subject within the FET curriculum that plays a critical role in scientific literacy, knowledge progression, and skills development. Learners in these grades were considered suitable participants, as they engage with increasingly complex curriculum content and assessment demands, making their experiences valuable for informing curriculum design and development.

A purposive sampling technique was used to select three secondary schools offering Life Sciences. This approach enabled the inclusion of diverse learner perspectives that are essential for understanding how curriculum content and structure are experienced by different learner groups. The total sample comprised 60 learners, all aged between 16 and 18 years. While the findings are not intended for statistical generalisation, the sample provided contextually grounded data that contribute to discussions on curriculum responsiveness, learner-centred design, and evidence-informed curriculum development in secondary education.

Data Collection Instrument

Data were collected using a pre-tested, structured, self-administered questionnaire designed to generate information relevant to curriculum content exposure, knowledge alignment, and learner understanding within the Life Sciences and related school subjects. The instrument was reviewed for clarity and content relevance prior to administration to ensure its suitability for the target age group and educational context.

The questionnaire consisted of two sections.

Section A: Socio-Demographic Information

This section collected background information on participants, including grade level and gender, to support the analysis of curriculum exposure and knowledge development across different learner groups and stages of the Further Education and Training (FET) phase.

Section B: Nutrition Knowledge and Curriculum Exposure

This section assessed learners' nutrition-related knowledge and exposure to nutrition education (NE) within the school curriculum. A five-point Likert scale (1 = Not Familiar to 5 = Extremely Familiar) was used to measure learners' familiarity with five key nutrition concepts commonly addressed or implied within Life Sciences and related subjects (e.g., the importance of a healthy diet, and the health risks associated with excessive carbohydrate intake).

In addition, Section B included closed-ended questions that assessed learners' exposure to nutrition education within the formal curriculum (yes/no/not sure), the grade level and subject in which nutrition-related content was received, and learners' awareness of basic food groups, measured using a checklist format. These items were included to determine how nutrition concepts are distributed across grades and subjects and to assess the extent to which curriculum design supports progressive knowledge development.

Overall, the data collection instrument was structured to capture information that informs discussions on curriculum coherence, content integration, and the alignment of health-related knowledge within secondary school curricula, thereby contributing to evidence-based curriculum design and development.

Data Analysis

Collected data were systematically cleaned, coded, and captured using Microsoft Excel, and subsequently analysed using JASP statistical software (Version 0.18.3). The analysis focused on generating insights relevant to curriculum content exposure, knowledge acquisition, and progression across grade levels.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed to summarise learners' demographic characteristics, levels of nutrition knowledge, and exposure to nutrition-related curriculum content. These statistics provided an overview of how key nutrition concepts are understood and experienced by learners within the secondary school curriculum.

To examine potential relationships between curriculum-related variables, chi-square tests of association were conducted. These tests explored associations between categorical variables, such as grade level and specific nutrition knowledge items, to determine whether curriculum exposure and knowledge differed across grades. Such analyses were used to identify patterns that may inform curriculum sequencing, coherence, and development within the Life Sciences curriculum and related subjects.

Findings were presented in tabular form to enhance clarity and support interpretation. The analysis was conceptually guided by the "Knowledge" construct of the Knowledge–Attitudes–Practices (KAP) model, which emphasises knowledge acquisition as a foundational element in curriculum design and learner development. This framework supported the interpretation of results in relation to curriculum effectiveness and content alignment.

Ethical Considerations

Ethical approval for the study was obtained from the University of the Free State General/Human Research Ethics Committee (Reference: UFS HSD2023/2584) and the

Provincial Department of Education. Institutional permission to conduct the study was granted by the principals of the participating schools.

Given the involvement of minors, strict ethical procedures were followed. Written informed consent was obtained from parents or legal guardians, and assent was obtained from all learner participants prior to data collection. Participation in the study was voluntary, and learners were informed of their right to withdraw at any stage without penalty.

To uphold ethical standards in educational research and curriculum-focused inquiry, anonymity and confidentiality were maintained throughout the study. No identifying information was collected, and all data were securely stored and used solely for academic and research purposes. These measures ensured compliance with ethical principles relevant to school-based research and safeguarded the rights and well-being of all participants.

Results

Sample Characteristics

The study sample consisted of 60 secondary school learners, with an equal gender distribution comprising 30 males (50%) and 30 females (50%). This balanced representation supports meaningful interpretation of learner experiences related to curriculum exposure across gender groups.

Participants were drawn from Grades 10 to 12, reflecting the full range of the Further Education and Training (FET) phase in which Life Sciences content is progressively developed. Of the total sample, 21 learners (35%) were enrolled in Grade 10, 19 learners (31.7%) in Grade 11, and 20 learners (33.3%) in Grade 12.

The relatively even distribution across grade levels allowed for comparative analysis of learners' knowledge and exposure to curriculum content across different stages of secondary education, thereby supporting examination of curriculum progression and sequencing within the Life Sciences subject.

Level and Nature of Nutrition Knowledge

Table 1 presents learners' self-reported familiarity with selected core nutrition concepts, reflecting areas of knowledge emphasised or under-emphasised within the school curriculum. The overall mean familiarity score across all nutrition items was 3.8, indicating a moderate level of nutrition knowledge among learners in the Further Education and Training (FET) phase.

Marked variation was observed across individual nutrition concepts. Learners reported the highest levels of familiarity with the benefits of including fruits and vegetables in the diet (mean = 4.5; SD = 0.7), with the majority indicating that they were either extremely or moderately familiar with this concept. Similarly, a high level of familiarity was reported for the risks associated with excessive fat intake (mean = 4.2; SD = 1.0).

In contrast, familiarity with the risks of including too many carbohydrates in the diet was substantially lower (mean = 2.7; SD = 1.4). One quarter of the learners (25%) reported that they were not familiar with this concept, while an additional 20% indicated that they were only

slightly familiar. This pattern suggests uneven knowledge distribution across nutrition topics presented within or alongside the formal curriculum.

Moderate familiarity levels were reported for the importance of a healthy diet (mean = 3.8; SD = 1.0) and healthy foods to be eaten daily (mean = 3.9; SD = 1.3). Collectively, these findings provide descriptive evidence of learners' nutrition knowledge profiles and highlight variation in familiarity with specific concepts relevant to curriculum content and emphasis.

Table 1

Learners' Familiarity With Issues Related to Nutrition (N = 60)

Nutrition Issue	Extremely Familiar n (%)	Moderately Familiar n (%)	Somewhat Familiar n (%)	Slightly Familiar n (%)	Not Familiar n (%)	Mean (SD)
Importance of a healthy diet	15 (25.0)	24 (40.0)	16 (26.7)	2 (3.3)	3 (5.0)	3.8 (1.0)
Healthy foods to be eaten daily	31 (51.7)	9 (15.0)	13 (21.7)	1 (1.7)	6 (10.0)	3.9 (1.3)
Risks of too many carbohydrates	10 (16.7)	11 (18.3)	11 (18.3)	12 (20.0)	15 (25.0)	2.7 (1.4)
Risks of too much fat	35 (58.3)	13 (21.7)	6 (10.0)	6 (10.0)	0 (0.0)	4.2 (1.0)
Benefits of fruits and vegetables	39 (65.0)	13 (21.7)	5 (8.3)	2 (3.3)	1 (1.7)	4.5 (0.7)

Exposure to Nutrition Education and Food Group Awareness

Table 2 summarises learners' self-reported exposure to nutrition education (NE) within the formal school curriculum and their awareness of basic food groups. The majority of learners (83.3%) indicated that they had been exposed to nutrition-related content at some point during their schooling.

Reported NE exposure was highest in Grade 10 (35.0%) and lowest in Grade 11 (8.3%). Notably, no Grade 12 learners reported recent exposure to nutrition education. With regard to subject placement, nutrition-related content was most frequently reported in Natural Science and Technology (45.0%), followed by Life Sciences (35.0%), indicating that nutrition education was distributed across subjects rather than consistently embedded in a single curriculum area.

Learners' awareness of food groups varied across categories. Awareness was highest for Fruits and Vegetables (100%) and Fats (78.3%), while awareness of Carbohydrates was comparatively lower (60.0%). This pattern mirrors disparities observed in reported familiarity with specific nutrition concepts.

A chi-square test of association revealed a statistically significant relationship between the grade level at which nutrition education was received and awareness of carbohydrates ($\chi^2 =$

12.85, $p = 0.012$). Learners who reported receiving nutrition education in earlier grades demonstrated higher awareness of carbohydrates compared to those exposed in later grades. No statistically significant associations were observed for other food groups.

These findings provide descriptive evidence of variation in curriculum exposure and content emphasis across grades and subjects, highlighting differences in learner awareness that are relevant to curriculum sequencing and content integration.

Table 2

Learners' Exposure to School Nutrition Education (N = 60)

Variable	Category	n (%)
Learnt about Nutrition	Yes	50 (83.3)
	No	0 (0.0)
	Not Sure	10 (16.7)
Grade NE was Taught	Grade 8	15 (25.0)
	Grade 9	19 (31.7)
	Grade 10	21 (35.0)
	Grade 11	5 (8.3)
	Grade 12	0 (0.0)
Subject Teaching NE	Life Sciences	21 (35.0)
	Natural Science & Tech	27 (45.0)
	Life Orientation	12 (20.0)
Food Group Awareness	Carbohydrates	36 (60.0)
	Fruits & Vegetables	60 (100.0)
	Proteins	45 (75.0)
	Fats	47 (78.3)
	Dairy Products	39 (65.0)

Discussion

This study offers insight into adolescents' nutrition literacy within a South African school district and, when viewed through the lens of curriculum design and development, reveals important strengths and critical structural gaps in the current Nutrition Education (NE) curriculum. Learners demonstrated strong awareness of the benefits of fruit and vegetable consumption and the health risks associated with excessive fat intake. This pattern reflects the dominant focus of global and national public health campaigns, which have consistently prioritised plant-based foods and framed dietary fat as harmful (Temme et al., 2020). From a curriculum perspective, this suggests that certain nutrition messages are effectively transmitted; however, they may be overemphasised at the expense of a balanced and conceptually integrated understanding of nutrition.

In contrast, the notably low awareness of the risks of excessive carbohydrate intake highlights a significant curricular omission. This is particularly concerning in a context where staple diets are predominantly carbohydrate-based and where adolescent overweight and obesity are rising (Sedibe et al., 2018; Shisana et al., 2013). The findings suggest that the existing curriculum may insufficiently address macronutrient complexity, including distinctions between carbohydrate types, quality, and appropriate consumption levels. Rather than supporting conceptual understanding, current curriculum content may inadvertently foster oversimplified

or misleading narratives, such as the perception that carbohydrates are either inherently unhealthy or unproblematic, depending on exposure.

The concentration of NE exposure in Grade 10, with limited continuation in subsequent grades, points to a fragmented and episodic curriculum structure rather than a deliberately sequenced learning progression. Effective curriculum design literature advocates for spiral or vertical articulation, where core concepts are revisited with increasing depth and cognitive demand over time (Kyere et al., 2020). The absence of such progression in NE suggests that curriculum development has prioritised content inclusion over conceptual continuity, reducing opportunities for consolidation and transfer of knowledge into practice.

Furthermore, the allocation of NE content across three subjects, without a clearly designated curricular home, raises concerns regarding coherence and curriculum ownership. When accountability for key content is dispersed, messaging may become inconsistent and superficial, as reported in earlier South African studies (Nguyen et al., 2017; Ronto et al., 2017). From a curriculum design standpoint, this fragmentation risks diluting both depth and pedagogical intent, undermining learners' ability to construct an integrated understanding of nutrition. The observed association between earlier-grade exposure and improved carbohydrate awareness reinforces the educational value of early introduction paired with systematic reinforcement, rather than isolated content delivery.

The stark contrast between universal awareness of fruits and vegetables and limited understanding of carbohydrates also suggests a curriculum bias toward food-based messaging instead of systems-based nutrition literacy. Within the Knowledge–Attitude–Practice (KAP) framework, incomplete or imbalanced knowledge constrains the development of informed attitudes and sustainable dietary behaviours (Launiala, 2009). Curriculum design that prioritises slogans or singular food groups over conceptual models of balance and moderation may therefore weaken the foundation needed for behaviour change.

Insights from the broader qualitative component of the study further emphasise that curriculum reform must be contextually responsive. Learners reported that even when nutritional knowledge is present, structural barriers—such as household poverty, limited food availability, and the dominance of low-cost, carbohydrate-dense convenience foods—significantly limit the translation of knowledge into practice (Steyn et al., 2011). This underscores the need for curriculum development that integrates nutrition knowledge with critical food literacy, socio-economic awareness, and problem-solving skills relevant to learners' lived realities.

Taken together, these findings suggest that strengthening adolescent nutrition literacy requires more than expanded content coverage. It calls for intentional curriculum redesign that ensures coherence, progression, and conceptual balance across grades, alongside pedagogies that acknowledge environmental constraints. Aligning NE with principles of effective curriculum design may enhance not only learner understanding but also the relevance and applicability of nutrition education in complex, resource-constrained settings.

Limitations

The study is limited by its relatively small, purposively selected sample drawn from a single district, which restricts the generalisability of findings. Reliance on self-reported data introduces potential recall and social desirability bias. Additionally, the cross-sectional design precludes conclusions about causality. Despite these limitations, the findings offer valuable

curriculum-relevant insights that can inform future health education curriculum design and development.

Conclusions and Recommendations

This study concludes that although South African adolescents in this sample have been exposed to Nutrition Education (NE) and demonstrate knowledge in select areas, their overall nutrition literacy remains uneven, partial, and insufficiently developed. A particularly concerning deficit was identified in learners' understanding of carbohydrates, a core macronutrient central to both dietary balance and the epidemiology of non-communicable diseases in South Africa. From a curriculum design perspective, NE delivery appears fragmented, temporally compressed into early high school years, and lacking a coherent, developmental structure that supports cumulative learning.

These findings suggest that the current NE curriculum prioritises content coverage over curricular coherence, conceptual progression, and reinforcement, limiting its capacity to build robust and transferable nutrition literacy. As a result, learners may acquire isolated facts rather than an integrated understanding of nutrition that can meaningfully inform attitudes and practices, as conceptualised in the Knowledge–Attitude–Practice (KAP) model.

To strengthen the “Knowledge” pillar of the KAP model through improved curriculum design and development, the following recommendations are proposed.

1. Curriculum Review and Redesign

The Department of Basic Education should undertake a systematic review of the Curriculum and Assessment Policy Statement (CAPS) with the aim of establishing a structured, sequential, and developmentally appropriate NE framework. This may involve:

- Clearly designating standardised NE modules across relevant subjects with explicit learning outcomes and conceptual links; or
- Exploring the feasibility of a standalone, credit-bearing health and nutrition subject in the senior secondary phase.

Such reforms would support curriculum coherence, reduce content fragmentation, and enable the implementation of a spiral curriculum approach in which key nutrition concepts—such as macronutrient balance—are revisited with increasing depth and contextual relevance.

2. Teacher Capacity Building

Effective curriculum implementation is dependent on teacher confidence and content knowledge. Targeted, ongoing professional development is therefore essential to equip teachers with comprehensive nutrition science knowledge, including nuanced macronutrient education, as well as pedagogical strategies that contextualise nutrition within learners' socio-economic and food environments. Strengthening teacher capacity would enhance curriculum fidelity and reduce inconsistencies in NE delivery across subjects and grades.

3. Targeted and Contextually Relevant Learner Resources

There is a clear need for the development of engaging, age-appropriate, and culturally relevant learning materials that directly address identified knowledge gaps. Particular attention should

be given to complex and under-taught areas such as carbohydrate quality, portion sizes, and diet–disease relationships. Curriculum-aligned resources that incorporate real-life food environments, affordability constraints, and critical food literacy may improve both learner engagement and conceptual understanding.

Future Research

Future studies should employ larger, nationally representative samples and longitudinal designs to assess the retention of nutrition knowledge and its translation into attitudes and behaviours over time. Further investigation is also needed into the interaction between curriculum content, learner knowledge, and external determinants such as household food security and the local food environment. Such evidence would be invaluable in informing responsive, context-sensitive curriculum development in nutrition education.

Author Contributions

BPM: Conceptualization (original study), Methodology, Investigation, Data Curation. VO: Writing – Original Draft, Project administration. VO: Conceptualization (manuscript structure), Formal Analysis structuring, Writing – Original Draft, Writing – Review & Editing.

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Declaration of Competing Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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