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# Pocket Book Education on Fruit and Vegetable Consumption to Improve the Knowledge of Primary School Students at SD Negeri 41 Sangkir, Agam Regency

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## ABSTRACT

Fruit and vegetable consumption among Indonesian children remains below recommendations, and limited knowledge is one of its predisposing factors. In Agam Regency, West Sumatra, only 8.26% of residents ate three to four portions of fruit and vegetables per day, and the partner school, SD Negeri 41 Sangkir, had no health education media. This community-based health promotion activity aimed to improve students' knowledge of fruit and vegetable consumption using a self-designed pocket book and to evaluate the change in knowledge. A one-group pretest–posttest design was applied to all 36 students of grades III–V (total sampling) between 17 and 24 May 2021. After a baseline interview, students received the pocket book "Fruit and Vegetable Consumption" together with repeated door-to-door explanations and parent-guided reading, and were reassessed with the same 20-item questionnaire. Mean knowledge scores increased from 47.92 (SD = 12.09) to 75.00 (SD = 11.21), a gain of 27.08 points (95% CI 21.71–32.45; relative increase 56.5%; normalized gain = 0.52, medium category; paired t-test, $t(35) = 10.24$, $p < 0.001$). The proportion of students scoring 70 or above rose from 2.8% (1 of 36) to 69.4% (25 of 36). Knowledge of recommended portions, the consequences of insufficient intake, and the source of vitamin K remained comparatively low after the intervention. Supporting factors included the absence of existing media, an attractive age-appropriate design, and parental involvement, whereas the one-group design, the short observation period, and the labor-intensive door-to-door delivery were the principal constraints. These findings

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indicate that a low-cost, portable pocket book can strengthen predisposing knowledge in primary school health promotion, provided that it is complemented by repeated reinforcement, teacher and parent involvement, and follow-up measurement of actual consumption.

## INTRODUCTION

Health development gives priority to promotive, preventive, curative, and rehabilitative efforts, including among primary school children, so that an optimal degree of health can be achieved. Dietary behavior is one of the most influential determinants of nutritional status because the quantity and quality of the food and drink consumed shape the health of individuals and communities (Kementerian Kesehatan RI, 2014). Fruits and vegetables are important sources of vitamins, minerals, and dietary fiber, and the vitamins and minerals act as antioxidants that help protect the body and reduce the occurrence of non-communicable diseases (Boeing et al., 2012; Kementerian Kesehatan RI, 2014). The World Health Organization recommends at least 400 g of fruit and vegetables per person per day (World Health Organization, 2003), which the Indonesian guidelines translate into about 250 g of vegetables and 150 g of fruit, or 300–400 g per day for school-age children. For children aged 7–12 years this corresponds to three portions of vegetables and three to four portions of fruit daily (Kementerian Kesehatan RI, 2014). The recommendation is particularly relevant in a country where the prevalence of hypertension reached 34.1% in the 2018 Basic Health Research (Riskesdas) (Kementerian Kesehatan RI, 2018).

Despite these recommendations, fruit and vegetable intake remains low. In West Sumatra Province, only 3.23% of residents aged five years and older ate five or more portions per day and 10.70% ate three to four portions, while 19.43% did not eat fruit and vegetables every day. In Agam Regency, 25.43% of residents did not consume fruit and vegetables daily, 65.06% consumed one to two portions per day, 8.26% consumed three to four portions, and only 1.25% consumed five portions or more (Kementerian Kesehatan RI, 2018). Consumption behavior is influenced by knowledge and understanding of the benefits of fruits and vegetables, because better knowledge fosters a more positive attitude and informs the decision to act (Aswatini et al., 2008; Notoatmodjo, 2014). A study of junior high school students in Denpasar found that fruit and vegetable consumption was significantly associated with attitude, knowledge, food availability, and parental income (Rachman et al., 2017), and dietary patterns that include fruit and vegetables were significantly associated with hypertension in a coastal community in North Sumatra (Susanti et al., 2020).

In the PRECEDE framework of Green, knowledge is a predisposing factor, the availability of educational media is an enabling factor, and the attitudes and behavior of teachers and other role models are reinforcing factors (Green & Kreuter, 2005; Notoatmodjo, 2005). Children aged 6–12 years are in a receptive stage of growth and development, but they are also exposed to peer

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influence and offers of snack foods, and they quickly lose interest in monotonous teaching. The school is therefore an appropriate setting for creative, age-appropriate health promotion that builds healthy habits from an early age (Fikawati, 2017; Sanjaya et al., 2019).

SD Negeri 41 Sangkir, a public primary school in Lubuk Basung District, Agam Regency, faces exactly this challenge. In a preliminary survey on 25 January 2021, interviews with ten students showed that only three ate fruit and vegetables routinely and in sufficient amounts. An interview with a teacher confirmed that the school had no pocket book or comparable health education media. The health promotion unit of Puskesmas Lubuk Basung (the sub-district primary health center) had selected and coached school "little doctors" (*dokter kecil*) and school health unit (UKS) supervisors so that they could set an example and share health knowledge, but this approach had not yet been effective in raising students' knowledge of fruit and vegetable consumption. Three interrelated problems were therefore identified: students' limited knowledge of fruit and vegetable consumption, the absence of age-appropriate educational media at the school, and limited reinforcement of health messages beyond the classroom.

To address these problems, the service team proposed a school-based health promotion activity built on three components. First, the development of a colorful, illustrated pocket book entitled "Fruit and Vegetable Consumption." A pocket book is a small booklet that fits in a pocket and can be carried anywhere (Notoatmodjo, 2005), and it can serve as a learning resource that eases students' study of the material (Meikahani & Kriswanto, 2013). Its small, full-color format is intended to attract attention, and short texts supported by pictures are intended to help children understand and remember the content. Second, repeated door-to-door explanation of the booklet to each student, combined with guided reading at home with parents or guardians. Third, a pretest–posttest evaluation of the change in knowledge. The approach builds on earlier reports that nutrition pocket books raised nutrition knowledge among fifth-grade pupils at SD Muhammadiyah Dadapan (Eliana, 2012) and among mothers of underweight toddlers (Hadisuyitno, 2017).

The intended outputs were as follows. First, an increase in students' mean knowledge score on fruit and vegetable consumption, measured by a pre-test and post-test. Second, an age-appropriate pocket book that remains available at the school as a reference. Third, identification of the topics that remain weak after the intervention, so that follow-up education can be targeted. Fourth, recommendations for the school and the primary health center to sustain health education media for students. By achieving these targets, the activity is expected to strengthen knowledge, a key predisposing factor for healthier eating habits among primary school students in Agam Regency.

## METHODS AND IMPLEMENTATION

This community-based health promotion activity was carried out at SD Negeri 41 Sangkir, located in Jorong II Sangkir, Nagari Lubuk Basung, Lubuk Basung District, Agam Regency,

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West Sumatra Province, from 17 to 24 May 2021. The school was established in 1975 and had 76 students and 11 teachers and staff. It is equipped with six classrooms, a library, a school health unit (UKS) room, a canteen, six toilets, and six handwashing stations, but no health education media were displayed in the classrooms. Participants were all 36 students of grade III (n = 8), grade IV (n = 13), and grade V (n = 15), selected by total sampling. Students were eligible if they could read, agreed to take part, and were present during the activity. Nineteen participants (52.8%) were aged 11–12 years and 17 (47.2%) were aged 9–10 years; 20 (55.6%) were boys and 16 (44.4%) were girls. The activity comprised a preparation phase, an intervention phase, and an evaluation phase, and was evaluated with a quasi-experimental one-group pretest–posttest design.

The implementation method consisted of six stages. The first stage was a needs analysis through a preliminary survey on 25 January 2021, consisting of interviews with ten students and a teacher. The second stage was preparation, which included designing the pocket book and obtaining permits from the Department of Health Promotion of Poltekkes Kemenkes Padang, the National Unity and Politics Agency (Kesbangpol) of Agam Regency, the Lubuk Basung District Office, and the school. The third stage was the pre-test (17–18 May 2021): after the purpose of the activity was explained and informed consent was signed, each student was interviewed using the 20-item questionnaire. The fourth stage was the intervention. Immediately after the pre-test, a first researcher-led explanation was given door to door, after which the student received the pocket book and was asked to read it. The booklet was then used by parents or guardians to guide the child's reading, and a second researcher-led explanation was given during a home visit two days after the first (18–19 May 2021). The intervention therefore comprised three contacts: a first explanation, parent-guided reading, and a second explanation. The fifth stage was the post-test (19–20 May 2021), in which the same questionnaire was administered by interview. In the sixth stage, on 21 May 2021, the pocket book was handed over to the school library as inventory and the data were analyzed.

The pocket book was designed by the researcher to suit the age of the target students. Each page uses a different background color and is illustrated with pictures of fruits and vegetables to attract children's attention (Figure 1). The booklet, of about 20 pages and written in Indonesian, covers what fruits and vegetables are, what they contain (vitamins, minerals, and dietary fiber), the main vitamins and minerals, recommended daily portions, the benefits of consumption, the benefits of fruits and vegetables by color (blue/purple, green, white, yellow/orange, and red), and the consequences of insufficient consumption.

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(a) (b) (c) (d)

*Figure 1. Design of the pocket book "Fruit and Vegetable Consumption" (original Indonesian version): (a) cover, (b) introductory page "What are fruits and vegetables?", (c) page on the benefits of fruits and vegetables by color, and (d) page on green fruits and vegetables*

Knowledge was measured with a 20-item multiple-choice questionnaire covering the classification of fruits and vegetables, their benefits, nutrient and vitamin content, color groups, recommended intake, and the consequences of insufficient intake. Each correct answer scored 1 and each incorrect answer 0, and the total was multiplied by 5 to give a score of 0–100. The questionnaire was tested for validity and reliability before use (Cronbach's $\alpha = 0.707$, above the 0.60 threshold). Data were processed through editing, coding, processing, and cleaning, and were analyzed with IBM SPSS Statistics 23. Descriptive statistics (mean, standard deviation, median, range, and frequency) were calculated, and the difference between pre-test and post-test scores was tested with the paired t-test at a significance level of 0.05. For comparability with other community service reports, the normalized gain (N-gain; Hake, 1998), the 95% confidence interval of the mean difference, and the standardized effect size for paired samples (Cohen's *dz*; Cohen, 1988) were also reported; the N-gain was calculated from the group means. Item-level results were summarized as the number and percentage of correct answers before and after the intervention.

## RESULTS AND DISCUSSION

The activity produced outcomes that can be grouped into four aspects: the improvement in students' overall knowledge, the changes in knowledge by topic, the role of the pocket book as an educational medium at the school, and the factors that supported and constrained the activity. Each is described in the following subsections.

### *Improvement in Students' Knowledge*

Pre-test and post-test measurements showed a significant improvement in knowledge. The mean pre-test score was 47.92 (SD = 12.09) on a 100-point scale, indicating a low baseline

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understanding; no student scored above 70, and three students scored only 25. After the intervention the mean post-test score rose to 75.00 (SD = 11.21), a mean gain of 27.08 points (95% CI 21.71–32.45), equivalent to a relative increase of 56.5% and a normalized gain of 0.52 (medium category). The paired t-test confirmed that the difference was statistically significant ($t(35) = 10.24$, $p < 0.001$) and the standardized effect was large (Cohen's $dz = 1.71$). Table 1 presents the score distribution.

**Table 1. Knowledge Scores of Students before and after the Pocket Book Intervention (n = 36)**

| Indicator | Pre-Test | Post-Test | Change |
|---|---|---|---|
| Mean score (0–100) | 47.92 | 75.00 | +27.08 |
| Standard deviation | 12.09 | 11.21 | – |
| Median | 50 | 75 | +25 |
| Minimum–maximum | 25–70 | 55–95 | – |
| Students scoring ≥ 70, n (%) | 1 (2.8%) | 25 (69.4%) | +24 students |

Source: Primary data from pre-test and post-test questionnaires, 2021. Paired t-test: $t(35) = 10.24$, $p < 0.001$

The share of students scoring 70 or above increased from 2.8% (1 of 36) to 69.4% (25 of 36), and the lowest score rose from 25 to 55. The lowest baseline scores were obtained by two nine-year-old grade III students and one eleven-year-old grade IV student, which suggests that age and grade level may influence knowledge (Notoatmodjo, 2014). Pre-test and post-test scores were only weakly correlated ($r = 0.074$, $p = 0.669$), indicating that students' rank order changed considerably rather than gains being proportional to baseline scores. Post-test scores still varied widely (55–95), so not every student benefited equally.

The result is consistent with the view that knowledge is acquired through the senses, mostly sight and hearing (Notoatmodjo, 2014): the pocket book combined illustrated text with oral explanation and therefore engaged both channels. It is also consistent with earlier reports that pocket books raised nutrition knowledge among fifth-grade pupils (Eliana, 2012) and among mothers of underweight toddlers (Hadisuyitno, 2017).

### *Changes in Knowledge by Topic*

Item-level responses (Table 2) show where the pocket book worked best. The largest gains were found for the vitamin C content of fruits (50% to 100% correct), the health benefits of blue and purple fruits and vegetables (19% to 69%), the recommended daily intake of 300–400 g (19% to 67%), the classification of fruits and vegetables (42% to 86%), and the benefits of vitamin C (31% to 75%). These topics are presented in the booklet with simple pictures and color cues, which probably made them easy to recall. In addition, the item asking where students obtained

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information about fruits and vegetables rose from 22% to 86% correct (8 to 31 students), but this appears to reflect exposure to the pocket book itself rather than learning of content. It accounted for roughly 3.2 of the 27.1 points of mean gain, so it is excluded from Table 2 and should be kept in mind when interpreting the overall score.

**Table 2. Correct Answers by Topic before and after the Pocket Book Intervention (n = 36)**

| Knowledge topic (questionnaire item) | Before, n (%) | After, n (%) | Change (pp) |
|---|---|---|---|
| Classification of fruits and vegetables (1) | 15 (42%) | 31 (86%) | +44 |
| Recommended frequency of vegetable intake (3) | 32 (89%) | 31 (86%) | −3 |
| Recommended daily portions of vegetables (4) | 10 (28%) | 24 (67%) | +39 |
| Consequences of insufficient vegetable intake (5) | 11 (31%) | 20 (56%) | +25 |
| Vegetable high in vitamin A (8) | 32 (89%) | 29 (81%) | −8 |
| Benefits of blue/purple fruits and vegetables (10) | 7 (19%) | 25 (69%) | +50 |
| Benefits of yellow/orange fruits and vegetables (11) | 13 (36%) | 15 (42%) | +6 |
| Fruit that is a good source of vitamin K (12) | 15 (42%) | 20 (56%) | +14 |
| Fruit high in vitamin C (13) | 18 (50%) | 36 (100%) | +50 |
| Benefits of vitamin C (15) | 11 (31%) | 27 (75%) | +44 |
| Recommended daily intake, 300–400 g (17) | 7 (19%) | 24 (67%) | +47 |
| Consequences of insufficient fruit intake (19) | 13 (36%) | 25 (69%) | +33 |

Source: Primary data from pre-test and post-test questionnaires, 2021. pp = percentage points. Items 2, 6, 7, 9, 14, 16, 18, and 20 are not shown; item 18 (source of information) is discussed in the text

Several topics remained difficult after the intervention. Only 42% of students answered correctly about the benefits of yellow and orange produce, 56% about the consequences of insufficient vegetable intake and about the source of vitamin K, and 67% about recommended vegetable portions. These topics involve more specific nutrient–health relationships and quantities that are

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harder for children aged 9–12 years to retain from a short exposure, and they should be prioritized in follow-up education. Two items with a high baseline accuracy (89%), the recommended frequency of vegetable intake and the vegetable highest in vitamin A, showed small declines of one and three students, respectively; these most likely reflect response variability and should not be over-interpreted.

### *The Pocket Book as a School Health Promotion Medium*

The results can be interpreted with Green's PRECEDE framework. Knowledge is a predisposing factor for health behavior, the availability of educational media is an enabling factor, and the attitudes and behavior of teachers who encourage healthy habits are reinforcing factors (Green & Kreuter, 2005; Notoatmodjo, 2005). Before the activity the school had no pocket books, posters, leaflets, brochures, or other health media, so the enabling factor was absent, and efforts through little doctors and UKS supervisors had not been enough to raise knowledge. By providing a self-designed pocket book, handing it over to the school library, and involving parents in guided reading, the activity addressed the predisposing and enabling factors at the same time and began to involve the home environment as a reinforcing factor.

Three design choices probably contributed to the gain. First, each page uses a different color and fruit and vegetable pictures suited to the age of primary school students, who quickly lose interest when teaching is monotonous. Second, the content was delivered through two channels, reading and oral explanation, in line with the principle that most knowledge enters through sight and hearing (Notoatmodjo, 2014). Third, exposure was repeated three times over several days (first explanation, parent-guided reading, and second explanation during a home visit), which allowed the material to be reinforced. In our view, school principals and teachers also remain important because they are role models whose example can encourage students to eat fruit and vegetables.

### *Supporting and Constraining Factors*

Several factors supported the activity: the absence of any existing health education media created a clear need that the pocket book directly addressed; the school granted permission and access to students and accepted the booklet into its library; the colorful, illustrated design matched the age of the students; and door-to-door delivery allowed parents and guardians to take part. In addition, the little doctors and UKS supervisors coached by the health promotion unit of Puskesmas Lubuk Basung offer an existing platform for sustaining the program. On the other hand, several constraints warrant attention: knowledge remained low on several topics even after the intervention; the interval between the intervention and the post-test was only a few days, so retention is unknown; door-to-door delivery is time-consuming and may be difficult to scale up; and the pocket book was designed by the researcher, with no formal expert validation reported.

Overall, the results demonstrate that a low-cost, age-appropriate pocket book combined with repeated explanation can produce a measurable increase in primary school students' knowledge

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of fruit and vegetable consumption. Several limitations should be acknowledged. The one-group pretest–posttest design has no control group, so history, maturation, and testing effects cannot be excluded, particularly because the same questionnaire was used at both measurements. One questionnaire item largely measured exposure to the booklet. Knowledge was assessed by interview, which may introduce response bias, and the outcomes were limited to knowledge: actual fruit and vegetable intake, attitudes, and long-term retention were not measured. Because knowledge is necessary but not sufficient for behavior change (Notoatmodjo, 2014; Rachman et al., 2017), follow-up activities should combine pocket book education with attitude- and practice-oriented approaches, such as parent and school canteen involvement, and should be evaluated with a controlled design.

## CONCLUSION

This health promotion activity using the pocket book "Fruit and Vegetable Consumption" at SD Negeri 41 Sangkir, Agam Regency, was successfully implemented and yielded measurable outcomes. The mean knowledge score of the 36 students in grades III–V rose from 47.92 before the intervention to 75.00 afterward, a gain of 27.08 points (normalized gain 0.52; paired t-test, $p < 0.001$), and the share of students scoring 70 or above increased from 2.8% to 69.4%. Knowledge improved most on food classification, vitamin C, color-based benefits, and recommended intake, whereas knowledge of the consequences of insufficient intake, the source of vitamin K, and recommended portions remained comparatively low. The main supporting factors were the absence of existing media, an attractive age-appropriate design, and the involvement of parents, whereas the main constraints were the short observation period, the one-group design, and the lack of retention data. It is recommended that students read the pocket book regularly and seek reliable health information; that the school cooperate with the primary health center to provide health promotion media, especially on fruit and vegetable consumption; and that future activities use a control group, longer follow-up, and behavioral outcomes, with continued reinforcement of the topics that remained low.

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