EDUCATION SCENARIO MODEL BRIEF - Dabaru: Social-Emotional Learning Kernels

Nigeria | 2020

Following several years of implementing non-formal education and tutoring programs in northeast Nigeria, the International Rescue Committee's (IRC) Nigeria country team decided to expand the program to implement new social-emotional learning activities. However, due to a limited budget for designing and developing the new program, the team wanted to better understand the cost implications of adding a social-emotional component to existing programs in order to maximize value-for-money. The IRC's Best Use of Resources (BUR) team developed a scenario model to help answer the team's key questions.

Use-Case for the Nigeria Scenario Model

A new intervention for improving social-emotional learning (SEL) had been tested in other contexts and the Nigeria team wanted to understand the cost of adding the SEL intervention to their existing education programing. However, the SEL intervention had multiple possibilities for implementation modalities and the Nigeria team needed to choose the most cost-efficient, given limited funding.

Existing Program Used for the Nigeria Scenario Model

The Nigeria team implemented a large-scale education program in the northeast areas of the country. The education program primarily used non-formal learning centers and tutoring methods to improve the literacy and numeracy of out-of-school, at-risk students and was typical of the kind of large-scale educational program onto which SEL kernels could be piggybacked in the future.

Cost Question(s) from the Research, Design, and Nigeria Teams:

- How much would each design model cost to implement for a set number of schools/students in Nigeria? Which were feasible given the low budget?
- What effect would different design models for training (length of training, accommodation/transit support for trainees) have on the cost per student?
- If the team implemented behavioral nudges to encourage teachers to adopt new practices, what effect would different nudge options have on the cost per student?
- How would the cost of the new SEL intervention compare to the cost per student of the existing tutoring and non-formal education programs, onto which they might be added?

Key Findings

- The driving cost of the program are the number of days and type of training provided to teachers to learn SEL practices. Given a limited budget, the team should identify the minimum days of training needed for teachers to effectively learn the SEL practices.
- While there are "returns to scale," with cost-efficiency improving as the number of children/teachers reached increases, the cost per child is expected to level off at ~1,000 teachers. The team should aim to implement the program to include at least 1,000 teachers to maximize cost-effectiveness if the pilot is shows improvements in student outcomes.
- The additional cost per child of the behavioral science-informed activities added minimal cost per child. Thus, activities hypothesized to increase impact of the SEL should be considered.
- **In comparison to other IRC SEL programs, the SEL kernels have the potential to be highly cost-effective if scaled.**

Introduction

Northeast Nigeria has long been a center of conflict, displacement, natural disasters, and weak state institutions. As of 2022, there are 1.5 million 5 to 14-year-old children across the country who are not in school; only 61 percent of children 5 to 11 years old regularly attend school.[1] In Northeast Nigeria the situation is even worse, with only 53 percent of children 5 to 11 regularly in school, and 2.8 million who are in need of education in emergencies.[2] Obstacles to attending school include social-economic and cultural barriers, conflict and displacement. As a result, many children in the Northeast have poor literacy and numeracy outcomes and miss the opportunity for social-emotional learning (SEL) often gained in classrooms worldwide.

To address these issues, the International Rescue Committee and partners implemented a large-scale Education in Emergencies (EiE) program in Northern Nigeria from 2018 to 2021. The program focused on improving literacy, numeracy, and SEL outcomes for children who either had not recently attended school or who were at risk of dropping out.

The Kernels Intervention

The Kernels intervention was initially developed by Harvard EASEL Lab in 2015 and has been used in the United States, Canada, and Brazil.[2] The goal of Kernels is to provide a low-cost, evidence-based, and context-adaptable method of integrating SEL learning into daily activities and routines in school settings.

A Kernel is a 10-minute activity (often a game, discussion topic, or behavioral practice) that learning facilitators (LF) can integrate into their daily curriculum. Each Kernel teaches one or more SEL skills. Examples include:

- **Belly breathing** – to teach emotional control
- **"Dear Abby" discussions** -- where students debate stories about moral quandaries and what is the right thing to do – to teach ethical responsibility
- **Role-plays** – to teach positive self-talk and interactions
- **The telephone game** – to teach about community responsibility

With the aim of providing the most effective assistance, the EiE program rolled out multiple interventions and conducted randomized impact evaluations on each. Interventions included the Accelerated Learning Program in non-formal school settings, coaching of learning facilitators (LFs), after-school tutoring programs to address literacy and numeracy outcomes, and a pilot of the Dabaru program or 'Kernels' approach to improve SEL outcomes. The goal was to determine the combination of interventions that would have the greatest impact on student outcomes per dollar spent.

This scenario analysis was conducted in partnership with the EiE research and design teams after the decision was taken to incorporate the kernels approach as a pilot within the wider EiE program. The kernel approach for Nigeria was developed in collaboration with the Airbel Impact Lab, IRC's Education Technical Unit, IRC Nigeria's Education team, and Harvard EASEL Lab. Kernels were intended to be flexible for learning facilitators, and the design team needed to determine exactly what modalities they would use to implement the program in Nigeria specifically, given their extremely limited budget for the pilot.

The team determined there were three key elements to implementing Kernels, and each had multiple options for how it might be accomplished:

		Possible Modalities
Key Elements of Kernels	**Training** teachers/learning facilitators on what Kernels are, why they are important, and how to use them	Variations of training type, duration, frequency, and trainee supported/not supported were considered. Three key variations were: • Whether trainings would go forward with or without master trainers (ToT method) • Whether training would take place in person with stipend/accommodation, or without a stipend/accommodation • The number of days of training provided
	Supplies and Activities needed to implement the Kernels	Kernel content and instructions could be delivered to learning facilitators in multiple ways, including those that were in-expensive in the short-term (paper-based) and some which might be more sustainable in the long-term (virtual). Options considered were: • Printed cards for teachers each with a fully explained Kernel activity • Virtual (SMS or Video) explanations of each Kernel • Combination of cards and virtual
	Ongoing support to teachers/learning facilitators	Options for behavioral nudges to encourage learning facilitators to complete kernels, including both technology and paper-based strategies, such as: • SMS reminder nudges via WhatsApp • Gamified activity completion checklist/wall poster • Certificates of participation for teachers • Teacher Learning Circles (in-person or virtual) • Classroom observations • Refresher training (of teachers and/or master trainers)

When deciding between the possible modalities for training, delivering, and reinforcing the SEL kernels the design team had several concerns. First, they wanted to ensure that the Kernels program was effective at improving SEL outcomes, thus the modalities they felt were most likely to be successful in improving these outcomes were prioritized. Second, similar to the other EiE interventions, the Kernel intervention would move to the evaluation stage if proving potentially impactful during the pilot. As a result, the long-term scalability of the various modalities was considered. Lastly, the pilot program itself had very limited funding, and limited funding was expected to be the status quo for future implementation of kernels if run at scale in Nigeria. This meant the team was keenly conscious of trying to be as cost-efficient in their design as possible.

To achieve this, the IRC teams worked with the Best Use of Resources team to develop a scenario analysis that would allow them to compare the different modality options against their ideas of effectiveness and the expected costs.

Scenario Analysis

The Best Use of Resource (BUR) team began by identifying appropriate costing data as the foundation of the analysis. BUR had previously conducted two cost-effectiveness studies of EiE programming and therefore had recent, relevant costing data to pull from.[1] Specifically, the costing data from the ALP evaluation provided the basis of cost data upon which the model was built.

The design team was interested in exploring the cost of as many combinations of implementation modalities as possible. Largely because this was a pilot and the design team represented stakeholders from various perspectives (educational technical staff from the Nigeria IRC program, Kernel experts from Harvard, and design experts from the IRC Airbel team) the team had varying viewpoints on which modalities would be best -- so comparing all of them was viewed as a key element for decision-making.

To accommodate this, the BUR team built a scenario model that works similarly to a calculator. This model included all of the individual "ingredients" of an education program, based on prior IRC experience, but explicitly linked the amount of each resource needed to the number of districts, schools, or children served. This allowed the Nigeria team to vary elements of the program and receive results both for the overall cost of the intervention, as well as the cost per teacher and the cost per child.

The Scenario Model

Scenario models are user-friendly workbooks that allow the user to modify key elements of the anticipated implementation model, context, and scale, and see projections of cost-efficiency results based on those parameters. For SEL kernels, the model started with Table A, asking users to define the program delivery methods.

The user can decide if the kernel intervention will be implemented as a stand-alone program (as the government or another NGO might use it) or as a 'piggybacked' program – as IRC was doing, leveraging the current education infrastructure for the ALP to implement the Kernel intervention.

TABLE A. Delivery Method	
Delivery Methods	**OPTIONS: Select 1**
Stand alone program?	No
Training	Training of Trainers (Cascaded)
Refresher Training?	No
Kernel Delivery	Printed Materials + Virtual
If "Virtual", choose SMS type	Goal Setting SMS
Ongoing Support *(Can select multiple)*	IGs, Checklist, Teacher Certificate

Next, the user can decide if training will be cascaded (IRC trains master trainers, master trainers train learning facilitators) or directed to learning facilitators. Historically, the Nigeria education team "best practice" included refresher trainings for teachers and learning facilitators several months after the initial content training. To capture this, refresher trainings were also included as one optional approach among the delivery methods.

The user can then select how the kernels will be delivered – either via printed cards, virtually via SMS, or as a combination of both. In the event that 'virtual' is selected, the user can then choose if the virtual

[1] Silvia Diazgranados Ferráns, Jeongmin Lee, Chinedu Ohanyido, Kayla Hoyer & Adane Miheretu (2022) The Cost-Effectiveness of an Accelerated Learning Program on the Literacy, Numeracy and Social-Emotional Learning Outcomes of Out-of-School Children in Northeast Nigeria: Evidence from a Mixed Methods Randomized Controlled Trial, Journal of Research on Educational Effectiveness.

method was focused on helping the teacher to set implementation goals, video demonstrations (growth), or a combination of both.

Lastly, the model user can choose one or more options for how ongoing support to learning facilitators would be delivered: teacher inquiry groups (teacher learning circles), certificates for completion of implementing the entire program, wall posters/checklists for tracking Kernel completion, or a combination of multiple options.

Once these program delivery options are selected the user moves on to input program parameters (as seen in Table B at right). Users are instructed to only insert values in the yellow cells, the others will be calculated automatically. "The program and education portfolio" section is used to help estimate support and overhead costs. The "Targets" section calculates the anticipated scale of the program. The "Trainings" section provides options for how trainings will be conducted and what costs would be required. The "Staffing" section details additional costs expected due to how staff benefits will be calculated and how frequently technical advisors will visit internationally. Lastly, the "Kernel Delivery" section provides inputs to estimate how much the SMS and print materials will cost (if selected in Table A).

TABLE B. Program Parameters

Paramenter that Impacts Intervention Cost	Units	Label
The Program & Education Portfolio		
Total # of programs in Education portfolio?	2	projects
Months of Program (including start-up)	7	*months*
Rounds of Program within length of time	1	*rounds*
Targets		
Number of master trainers	12	*master trainers*
Number of teachers	250	*teachers*
Avg. students per teacher	20	*students*
Number of schools	84	*schools*
Number of students	5000	*students*
Trainings		
Length of ToT	3	*day(s)*
Length of Training for teachers	3	*day(s)*
Length of refresher training	1	*day(s)*
Is accomodation provided for teacher trainings?	No	*< Select 1*
Is transportation provided for teacher trainings?	No	*< Select 1*
Number of staff per SMC being Trained	3	*persons*
Staffing		
Number of Trips per International Staff	2	*trips*
International Staff Benefits %	57	*%*
National Staff Benefits %	40	*%*
Kernel Delivery		
SMS Frequency per teacher	5	*per month*
Number of teachers receiving SMS	250	*teachers*
% surplus ordered of print materials	10	*%*

The inputs in Tables A and B automatically combine with unit cost data from the ALP program (Table C) to calculate the total estimated cost for the Kernel intervention, given the implementing conditions specified by the user. Cost estimates are presented as total program cost, cost per school, cost per teacher, and cost per student.

All inputs required to run the program are included in Table C. The table was created (as noted above) by pulling ingredients from existing Nigeria education analyses and working with the Education Coordinator to adjust and make changes as needed. Once the ingredients were defined, BUR worked with the coordinator to define the level of

TABLE C. SEL Kernel Ingredients for Program Implementation

Ingredients	Unit Cost	Units Needed	Total Cost
Project Management		**# of Staff**	
Education Coordinator	$ 255	1	$ 2,398
M&E Coordinator	$ 293	1	$ 2,754
Technical Advisor	$ 670	1	$ 6,292
Implementation Staff		**# of Staff**	
M&E Manager	$ 315	1	$ 2,642
M&E Officer***	$ 1,450	4	$ 45,066
Education Programme Manager	$ 110	1	$ 924
Education Officers	$ 145	8	$ 9,257
Travel			
International Travel	$ 3,000	2	$ 6,000
Domestic Travel	$ 750	13.3	$ 9,975
Trainings			
Master Trainer Training	$ 26	24	$ 615
Teacher Training	$ 26	722	$ 18,507
Training Certificates	$ 0.09	398	$ 36
School Management Committees	$ 26	363	$ 4,652
Supplies & Materials		**# of Recepients**	
Kernel Booklets	$ 4.68	398	$ 1,863
Teacher Letter	$ 0.09	398	$ 36
Teacher Certificates	$ 0.09	398	$ 36
Teacher Checklist	$ 0.09	398	$ -
School Tutoring Supplies	$ 2.73	0	$ -
Learner Supplies	$ 1.03	0	$ -
Additional Implementation Costs			
Teacher Stipends	$ 19	2166	$ -
Teacher Inquiry Groups	$ 2.45	2166	$ -
Cost per SMS	$ 0.05	31500	$ 1,575
Advocacy Campaigns	$ 228	6	$ 1,368
Technical Working Group Meetings	$ 2,113	6	$ 6,340

effort required by staff and other resources and how each input was tied to the parameters and delivery methods.

The ingredients list in Table C only models direct program costs. Shared program costs (SPC) and global costs (ICR) are calculated based on percentages in the same context from previous analyses. In this model, 33 percent was used (based on the percentage of costs going to SPC in the EiE ALP and EiE Tutoring cost-effectiveness analyses).

Results

The cost results were provided for the anticipated pilot scale of 250 teachers, and assuming the program would be 'piggy-backed' on existing education programing in Northeast Nigeria. Results were modeled for seven months, the anticipated time frame to implement the kernels among this many teachers.

Inputting the most pared-down possible implementation model in tables A and B, including only one day of training for ToTs and teachers, results in a total of $84,351 for seven months of implementation ($22 per student). While this is cost-efficient compared to other education programs, the design team believed that it would not be effective, as it dramatically limits elements of the intervention. Based on prior experience introducing teachers to SEL content, the Nigeria Education team felt strongly that a minimum of four days of training was needed for the material to be effectively taught to teachers.

Choosing the highest cost options (and thus maximizing the likelihood that the program would have an impact per education team members) results in a cost of a seven-month program being $208,223 ($55 per student), or nearly three times the cost of the most pared-down option. This includes four days of training for master trainers, four days of training for teachers, a one-day refresher training, and paying stipends and accommodation for trainees – the model preferred by the Education Coordinator to achieve maximum impact.

The BUR team identified that among the many variables in the scenario model, three had the greatest impact on costs:

- **Providing accommodation and stipends for trainings** was a program option suggested by the Nigeria education team. Based on their experience, the attendance, participation, and uptake of new content from LFs/teachers in Nigeria is substantively improved when accommodation and stipends are provided versus when only the training is provided. However, providing accommodation and stipends dramatically affects the cost of the SEL intervention. Holding all other design decisions the same, the cost per student drops from $55 to $31 when the stipends and accommodation are removed.
- **The total number of days of training** for master trainers, teachers, and refresher trainings are the single largest cost of implementing SEL kernels. Similar to the above, the cost per student drops from $55 to $29 when the master training and teacher trainings are reduced to one day each and the refresher training is removed (assuming accommodation and stipends *are* provided, if they are not, the cost drops to $24 per student). The Education Coordinator recommended a minimum of 3-day training and 1-day refresher training to ensure uptake given that SEL kernels are an entirely new topic area for LFs.
- **National program staff** is the second highest cost behind the cost of trainings. Staff costs are approximately a quarter of total spending in the high-cost program model, however, this percentage jumps to over 50 for the low-cost program model. This means a reduction of staffing is not a viable way to substantively reduce the cost of the program if a more expensive training

option is chosen. If the low-cost training option is chosen, costs in staffing become influential in the overall cost per student, and additional attention should be given to program management structures.

Importantly, the scenario model found that the variations of both how Kernels are delivered to learning facilitators (paper or virtual) as well as how ongoing support is provided had very little implication on cost-per-student. As such, the BUR team recommended that the design team choose whichever combination they felt would provide the highest likelihood of effectiveness, rather than make these decisions with reference to cost. Through the pilot research, the team found that teachers found the behavioral-informed supports to be more helpful than the Dabaru cards themselves. As a result, it is recommended to include the behavioral supports.

Conclusions and Application

Several lessons can be learned from the scenario model that apply both to this specific Nigeria program, and potentially to other staff/training-heavy programs in similar contexts.

Cost-efficiency can dramatically increase when programs reach greater scale, but the size of these "returns to scale" is highly dependent on the implementation model chosen

The results noted above are all based on training 250 learning facilitators because that was the expected scale of the pilot. However, the Nigeria team was also interested in what costs are *expected* to be assuming the pilot was successful and it was scaled up in the future. To help the team understand how costs would vary at scale, the BUR team chose a set of parameters that included most of the options the design team was considering and examined how cost per student would be expected to change as the program increased in scale. This scale model assumed that: the program would continue to be piggybacked on an existing education program, trainings would be cascaded, both printed and virtual materials would be used, both types of SMSs would be used, and all three ongoing support options (checklists, TIGs, and certificates) would be used.

Given this standard set of parameters, the team looked at the most expensive input: training, and how the cost per student would vary with different training structures, at different scales of implementation.

First, the team examined the high-cost training (with stipends and accommodation provision) with the total number of training days (including the refresher training, if provided) varying from zero to four days. They found that cost-per-student reduced as the program scaled from 250 to 1,000 teachers at a rate between 16 percent (four days of training) to 31 percent (zero days of training).

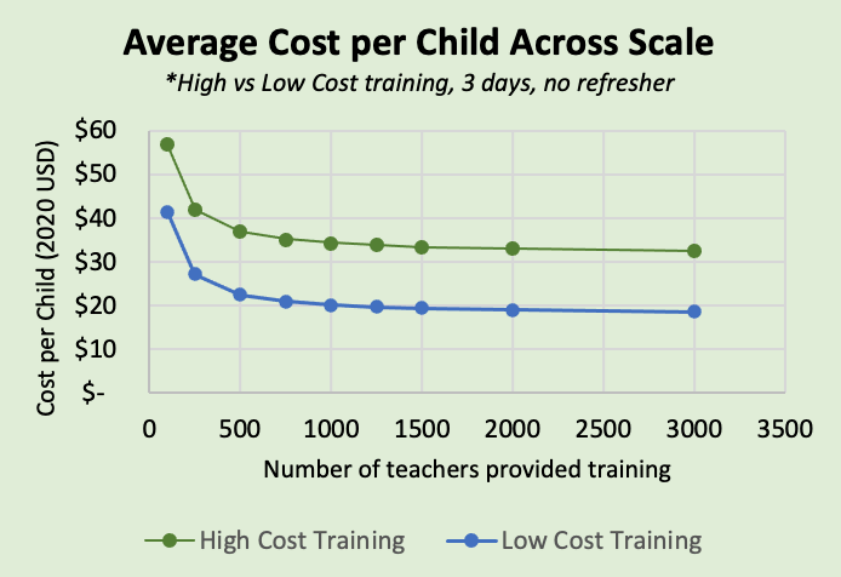
Results for the low-cost training (no stipend or accommodation) were similar: the cost-per-student was reduced as the program scaled from 250 to 1000 teachers at a rate between 25 percent (four days of training) and 35 percent (zero days of training).

Costs per Student at Scale for Full-Cost Training			
Scale	250 Teachers	625 Teachers	1,000 Teachers
Days of Training			
0	$ 22	$ 16	$ 15
1	$ 29	$ 23	$ 21
2	$ 35	$ 29	$ 28
3	$ 42	$ 36	$ 34
4	$ 49	$ 42	$ 41

Costs per Student at Scale for Low-Cost Training			
Scale	250 Teachers	625 Teachers	1,000 Teachers
Days of Training			
0	$ 22	$ 16	$ 15
1	$ 24	$ 18	$ 17
2	$ 25	$ 20	$ 18
3	$ 27	$ 22	$ 20
4	$ 29	$ 23	$ 22

The Effects of Scale

Given these cost reductions at scale, the team wanted to understand how large the program would need to be to capture most of the efficiency gains from scale. To do so, the BUR team created cost curves looking at both the expensive training and the less-expensive training. They chose to look at a program model with three total days of training, as the design team felt this was the minimum number of days needed for the project to be successful. Graphs of the resulting cost curves can be seen at right.



Regardless of the type of training (high or low cost), the cost curves show that cost-efficiency gains per student begin to level off at around 1000 teachers participating in the program. The team found that for the high-cost training, once at least 1000 teachers were participating, the cost per child would be expected to be between $33 to $34 per student. Likewise, the low-cost training would be expected to cost between $19 and $20 per student, once the 1000 teacher threshold was met. As a result, to maximize the cost-efficiency of the program, it was recommended that the team aim to reach at least 1,000 teachers if it is proven to be effective and rolled out more widely.

Cost-Efficiency Implications

In the end, the lowest cost implementation model was chosen for the pilot: two days of total training for 250 teachers, providing instruction to 20 students each. The IRC was unable to provide accommodation or transportation stipends due to budget restraints. Given these parameters, the estimated cost per child was approximately $25. This is slightly less than 1/3 the cost per child for IRC to implement non-formal education ($88/child) or tutoring ($83/child) in Northeast Nigeria..[2] If funding per child did not increase, adding the SEL kernels to existing implementation could displace funding and lower the total number of children provided services. Alternatively, if kernels were added on top of a non-formal education or tutoring program, staff would want to assure that the impact was worth the additional investment per child.

Applying the Results

The conclusions and findings detailed above were taken into consideration during the design and piloting stage of Dabaru. The BUR team was able to recommend the most appropriate implementation model, and a maximum number of training days, to fit the budget for pilot implementation.

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2 Hoyer, Kayla. 2019. "Education Cost Effectiveness Brief – Education in Emergencies." The International Rescue Committee.; Hoyer, Kayla. 2019. "Education Cost Effectiveness Brief – Tutoring." The International Rescue Committee.

While the budget was a limiting factor during the pilot, in subsequent phases BUR recommended, implementing at least three days of initial training, reaching at least 1000 teachers to capture returns to scale, and optimizing the number of direct program staff. As a result of the minimal additional cost per child of providing behavioral science-informed support, it was recommended that all such activities be implemented if the team suspected they would increase uptake and impact.

If Dabaru was implemented in traditional classroom sizes for the region, 90 students vs. 20 in the pilot, the cost per child is expected to decrease. In addition, if the trained teachers provide SEL kernel instruction to additional cohorts in future, the cost per child is expected to decrease as those initial training investments are spread over more students.

Looking Forward

The pilot saw high teacher and student engagement and was well received. In 2022, the BUR team ran a cost-efficiency analysis on the pilot implementation. The actual cost per student in the pilot was $22 (including inception costs, direct and shared costs). In comparison to existing IRC SEL programs, there is potential for Dabaru to be highly cost-effective. The project is moving into the evaluation phase in 2023 and a complete cost-effectiveness analysis will be conducted.

Methodology Note – Scenario Modeling

The Best Use of Resources (BUR) team at the International Rescue Committee works with field teams and technical units on several types of cost analyses. One of these analysis types is scenario modeling. The value of a costing scenario analysis is that it helps program design teams and advocacy teams to answer 'what if' questions about modifications to a specific program prior to making decisions. For example, a technical team may have a limited budget and want to know how many of each of their ten ideal activities they can implement with the funding available. Or an advocacy colleague may be working with a national government to promote the uptake of an IRC education program at scale and need to have projections of what such programing might cost.

Four key pieces of information are required for the BUR team to complete a scenario analysis: 1) there must be an existing program in the context for which the scenario is being developed to use as a basis for cost data- thus scenario analysis cannot model a completely new program or a program in a completely new context; 2) there must be a clear use-case- meaning there must be a clear understanding of who will use the scenario analysis and why it is needed; 3) There must be a clear cost question of interest, as the more variables within a scenario model, the less accurate it will be – it is necessary to be explicit about what variables are used in the model to answer what specific question(s).

[1] Education in Nigeria. UNICEF. 2022. https://www.unicef.org/nigeria/education.
[2] SEL Kernels of Practice. https://hundred.org/en/innovations/sel-kernels-of-practice

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