



Measuring the Effectiveness of PLT Secondary Module through Formative Evaluation

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Objectives of Formative Evaluation

Formative evaluation differs primarily from other types of evaluations by its purpose of use; it is used to improve programs by pilot-testing materials with intended audiences and incorporating their feedback and revisions into the final program.¹ To test the usefulness and effectiveness of the new resource for teachers, *Climate Change and Southeastern Forests*, which has been developed through a partnership with the national environmental education program Project Learning Tree® (PLT), the evaluation and research team based at the University of Florida's developed and conducted a formative evaluation during fall 2013.

Evaluation Questions and Timeline

Teachers' Questions

- What are your perceptions of the activities?
- How can the activities be improved?
- What are your perceptions of the online training resources?
- How can the online training resources be improved to increase educators' abilities and confidence to teach about climate change and forests?

Students' Questions

- To what degree did students meet the activity objectives?
- To what extent did these activities change students' knowledge, skills, and attitudes?

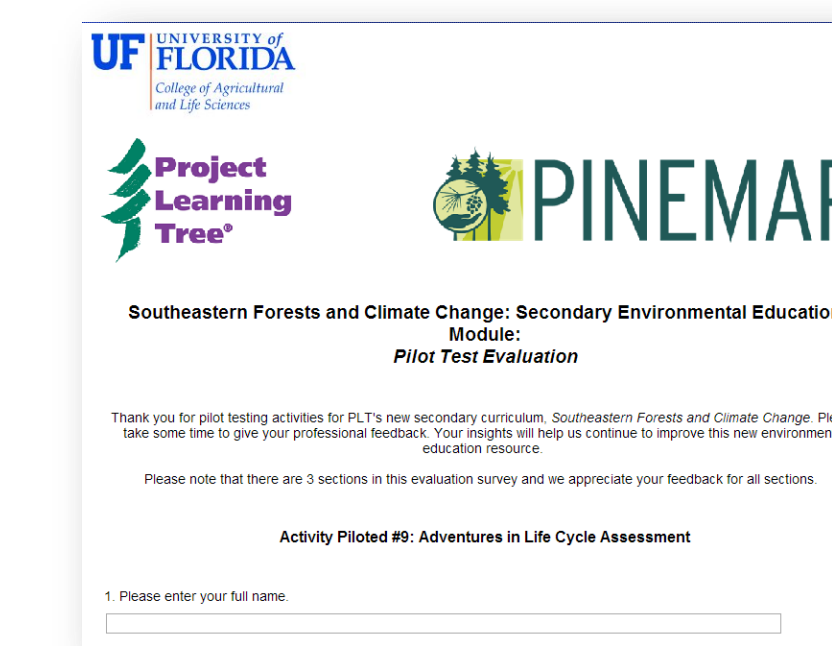
Timeline



Tools Development and Modification

The following tools were used in the formative evaluation:

- Teacher Activity Questionnaire (online, activity-specific)
- Teacher Interview Form
- Student knowledge test (parallel questions on pre and post)
- Student Attitude Scale



Participants

We provided two options for pilot testers to test either 2 or 4 activities. Forty-four pilot testers completed their evaluation forms by January 24, 2014. About half (53%) of the teachers used the activities in environmental science and advanced placement (AP) environmental science classes. The pilot testers were from Florida (45%). The program reached more than 1500 students.

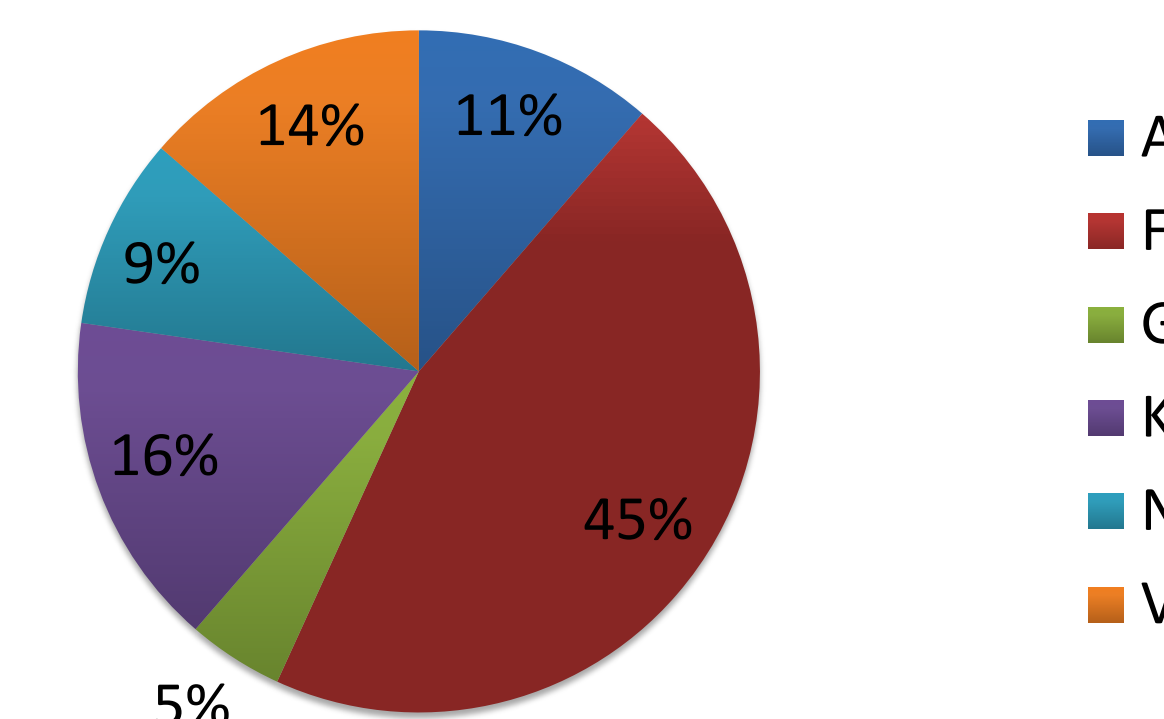


Figure 1: State distribution of responding teachers

Results

Teachers' Perspectives

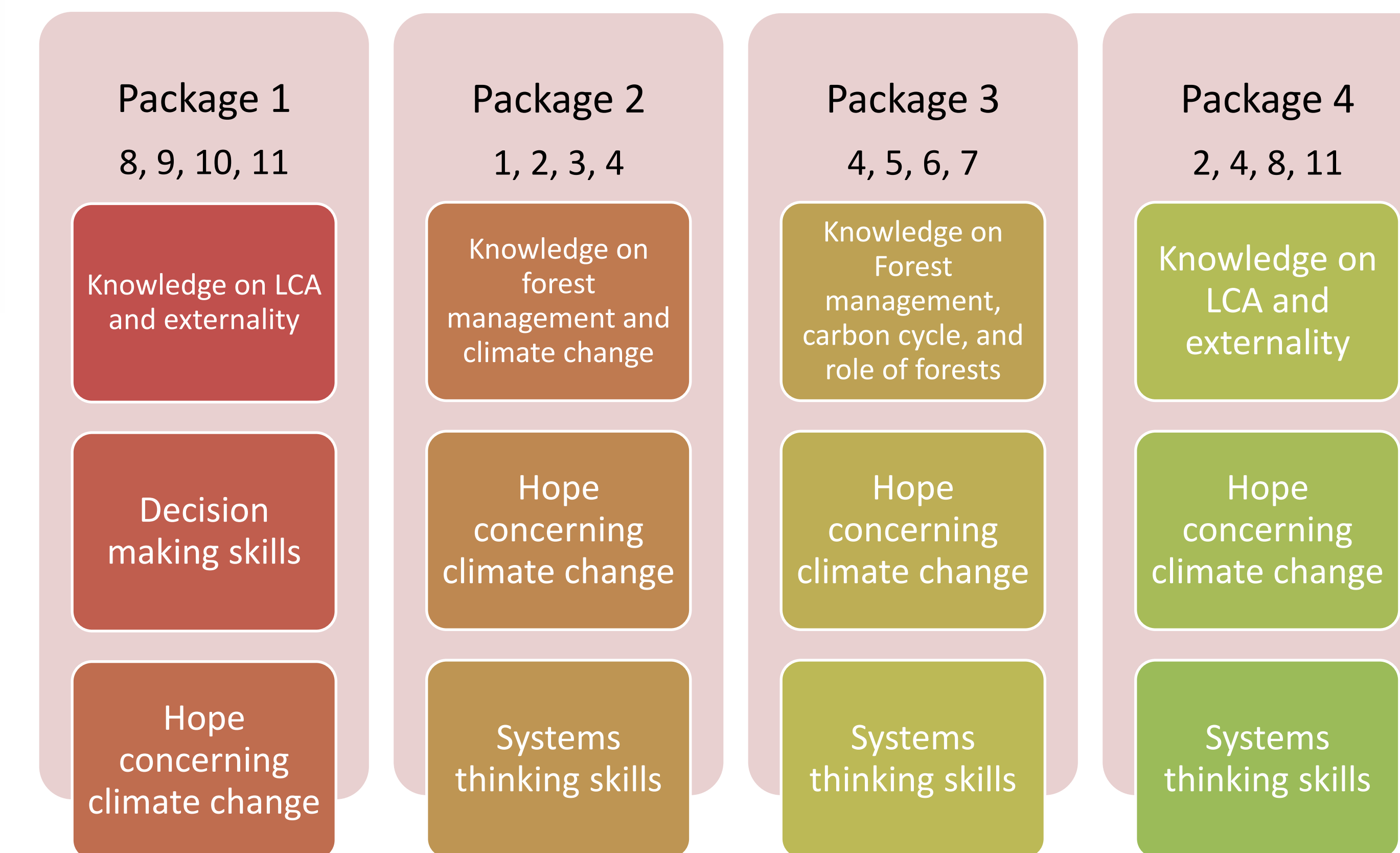
- Overall, positive comments about the organization and detail of the materials and online supplemental resources
- About 90% of teachers said the activity they pilot tested was ready for classroom use
- High school teachers agreed that their students were able to meet the activity's stated objectives and the activity procedure was appropriate for their students
- As expected, middle school teachers suggests that the activities were a little more challenging and the students were slightly less able to meet stated objectives as compared to high school students
- Middle school teachers provided suggestions on adaptation and modification
- Online training resources and module website effectively prepared them to use these activities (*Mean*=4.58, *SD*=0.58) and built their confidence to teach about climate science topics (*Mean*=4.54, *SD*=0.56)

"I loved it (activity 2)! This activity taught me a lot about different perspectives and viewpoints from other people and opened my eyes to new horizons!"
- High school student from Florida

"Thank you for great materials. I will be using for my spring semester. I have tried a couple of pioneer lessons in the past and this is by far the most organized, having the video clip to show teachers what to do is priceless."
-North Carolina environmental science teacher

Students' Learning

We grouped the module activities into 4 packages in order to measuring changes on different learning outcomes.



Data suggest that:

- there was a significant increase in knowledge on forest management, carbon cycle, and role of forests in mitigating climate change
- hopefulness toward climate change was significantly improved
- decision-making skills toward consumption was significantly increased
- systems thinking skills was significantly improved among students from package 4 (Table 1)

Table 1 Dependent t-test results from students pre and posttests

Learning Outcomes	Pretest Mean (N)	Posttest Mean (N)	T
Knowledge on forest management, carbon cycle, and role of forests in mitigating climate change	4.61 (238) ^{p3}	6.33 (238)	9.05***
Knowledge on LCA and Externality	2.83 (114) ^{p1}	4.25 (114)	5.97***
System thinking skills	1.92 (182) ^{p3}	1.94 (182)	0.54
	2.21 (194) ^{p4}	2.40 (194)	2.15*
Hope concerning Climate Change	56.78 (223) ^{p3}	58.59(223)	2.90**
Decision Making skills	29.24 (174) ^{p1}	30.24 (174)	2.16*

*p<.05; ** p<.01; *** p<.001

Discussion

The results from formative evaluation suggested that the module activities were well-designed and successfully engaged students in learning scientific concepts. Teachers provided positive comments about the organization and online training resources and valuable suggestions on how to improve the resource. The module writing team has taken into account and incorporated them into the revisions. Formative evaluation is powerful and critical or educational and extension program development.