Journal of Agricultural Education, 65(3), 292-303
https://doi.org/10.5032/jae.v65i3.2767

Evaluating Land-Based Learning as a Pedagogical Approach

Aaron J. McKim[1]
Abbey L. Palmer[2]
R. Bud McKendree[3]
Phillip Warsaw[4]
James DeDecker[5]

Abstract

Founded on the principles of place-based education, land-based learning collaboratively engages learners and community members in a four-step process of identification, understanding, intervention, and evaluation to enhance the sustainability of community-based agricultural systems. While scholars have provided the philosophical foundation for land-based learning, there have been no quantitative evaluations of learners engaged in this innovative pedagogical approach. Therefore, the current study explored students from two high schools in Michigan's Upper Peninsula who participated in a land-based learning experience focused on increasing local food purchasing within their high school cafeterias. Using pre-experience and post-experience surveys, student learning gains in local food awareness, local food behaviors, and eight leadership factors were evaluated. Results from the research include statistically significant gains in local food awareness, local food behaviors, empowerment efficacy, and decision making when comparing post-experience data to pre-experience data. Findings contribute to the nascent body of literature suggesting land-based learning is an effective pedagogical tool for promoting student growth. Recommendations for expanding the use of land-based learning; increasing funding to support its implementation; and targeted scholarship to inform the growth of land-based learning are also explored.

Keywords: community engagement; land-based learning; leadership development; local food systems; pedagogy; place-based education

Introduction

Land-based learning is an innovative pedagogical approach structured to optimize the learning potential of place-based, interdisciplinary, and problem-centered instruction (Jennings et al., 2005; Palmer et al., 2023; Rodriguez, 2008; Simpson, 2014; Sobel, 2005; Webber, 2017). Students in a land-based learning experience engage in four phases: (a) *identification* of a local agricultural context and relevant community partners, (b) *understanding* the selected context and associated challenges, (c) implementation of an *intervention* to address identified challenges, and (d) *evaluation* of the intervention (McKim et al., 2019). The seminal work on land-based learning within agricultural education suggests it is a useful tool

[1]Aaron J. McKim is an Associate Professor in the Department of Community Sustainability at Michigan State University, 480 Wilson Rd., East Lansing, MI 48824, amckim@msu.edu. https://orcid.org/0000-0002-0600-3611
[2]Abbey L. Palmer is a Community Food Systems Educator at the Upper Peninsula Research and Extension Center at Michigan State University, E3774 University Dr., Chatham, MI 49816, palmerab@msu.edu. https://orcid.org/0009-0007-3250-7649
[3]R. Bud McKendree is an Owner/Manager of Florida Green Keepers, 1401 NW 53rd Ave, Gainesville, FL, 32609, buddy@floridagreenkeepers.com. https://orcid.org/0000-0003-0351-777X
[4]Phillip Warsaw is an Assistant Professor in the Department of Community Sustainability at Michigan State University, 480 Wilson Rd. East Lansing, MI 48824, warsawph@msu.edu. https://orcid.org/0000-0003-1686-181X
[5]James DeDecker is Director of the Upper Peninsula Research and Extension Center and an Extension Specialist in Community Food Systems at Michigan State University, E3774 University Dr., Chatham, MI 49816, dedecke5@msu.edu.

for increasing academic learning, leadership skills, sustainability awareness, and community resilience (McKim et al., 2019). As land-based learning shifts from concept to practice, research exploring the efficacy of this innovative approach is needed to justify expanded implementation. Therefore, the current study explores student self-perceptions in relation to participating in a land-based learning experience focused on local-food procurement in two Michigan Upper Peninsula (U.P.) high school cafeterias.

The primary aim of this research is to evaluate the efficacy of land-based learning; however, it is also important to introduce the need for the specific implementation of land-based learning being evaluated within this research. As introduced, this implementation of land-based learning positioned students to work with community members to increase local food purchasing within their school cafeterias. Focusing on local food systems was an intentional choice compelled by three motivating factors. First, the U.P. is a food insecure region, with an increasing rate of food insecurity already above the national average (Feeding America West Michigan, 2020). Second, the U.P. suffers from financial insecurity, with the median household income below the state average (US Census Bureau, 2020). And third, the U.P. lacks formalized school-based agricultural education programs. In combination, these factors detail a region in which actively engaging youth in food systems learning while addressing food insecurity and creating new markets for local producers was timely and relevant. Furthermore, engaging youth in local food system learning is essential to empowering future generations to address complex challenges within the food system (Bobronnikov et al., 2021).

Purpose and Objectives

The purpose of this study was to evaluate the efficacy of land-based learning as a pedagogical approach. Results from this analysis will inform considerations for the expanded use of land-based learning. To achieve this purpose, the following research objectives were developed: (a) compare the local food awareness of students before and after engagement in a land-based learning experience, (b) compare the local food behaviors identified by students before and after a land-based learning experience, and (c) compare the leadership abilities perceived by students before and after engagement in a land-based learning experience.

Literature Review

The literature base around land-based learning is still developing; however, review of existing research illuminates three salient themes: (a) philosophical antecedents of land-based learning, (b) potential impact of land-based learning, and (c) existing scholarship on land-based learning.

Philosophical Antecedents of Land-Based Learning

In the 1970s, environmental education emerged as a critical addition to the education landscape (Powers, 2004). However, a critique arose within environmental education regarding an overemphasis on global over local challenges (Smith, 2002; Sobel, 2005). Thus, place-based education emerged as an evolution of environmental education (Webber, 2017). As the name implies, place-based education seeks to harness the learning potential of an individual's sense of place (e.g., location ascribed meaning because of a connection to individual identity). Foregrounding places with meaning during a learning experience increases learner engagement and investment in the content (Cannatella, 2007). Place-based education is the foundation upon which land-based learning was designed. Land-based learning, however, expands place-based education by clarifying the role of the learner as an active leader in community betterment (McKim et al., 2019). Further, land-based learning details progression toward sustainability as the objective for student-led interventions. In their work, McKim et al. (2019) operationalize a community progressing toward sustainability as one seeking to achieve economic and environmental resilience alongside the promotion of social equity. Therein, land-based learning is defined as "a pedagogical approach in which

learners collaborate with community members to implement place-based interventions within [agriculture, food, and natural resources] to increase the sustainability of their community" (McKim et al., 2019, p. 175). The emphasis on students actively improving community sustainability within agriculture, food, and natural resources contexts differentiates land-based learning from place-based education; land-based learning is, however, conceptualized as a specific approach under the place-based education umbrella.

Potential Impact of Land-Based Learning

As introduced, scholarship in land-based learning suggests the outcomes of this pedagogical approach may include academic learning, leadership skills, sustainability awareness, and community resilience (McKim et al., 2019). The outcomes being investigated in the current study are sustainability awareness and leadership skills. Sustainability awareness refers to learners who gain an appreciation for the natural world alongside an active commitment to bettering the environment (Gruenewald, 2003; Sobel 1996). Existing implementations of place-based education suggest it is an effective approach for developing sustainability awareness (Jennings et al., 2005; Webber, 2017); therefore, it is reasonable to assume land-based learning would have a similar impact. Thus, the current study (i.e., investigating a land-based learning experience focused on local food systems) included evaluating the specific outcomes of local food awareness and local food behaviors.

In addition to sustainability awareness, land-based learning has the potential to increase leadership skills (McKim et al., 2019). Leadership is an umbrella concept comprising multiple attributes, including social responsibility, decision making, and collaboration. Scholarship suggests place-based learning opportunities can increase leadership skills (Jennings et al., 2005; Palmer et al., 2023; Rodriguez, 2008; Simpson, 2014; Sobel, 2005; Webber, 2017). Thus, it is reasonable to evaluate land-based learning in relation to student gains within leadership skills like social responsibility, decision making, and collaboration.

Empirical Studies on Land-Based Learning

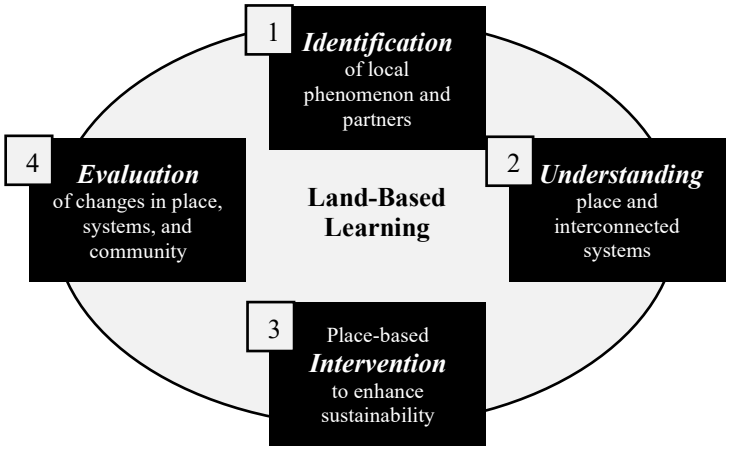
Outside the philosophical primers on land-based learning, there is one empirical, published study evaluating the efficacy of this pedagogical approach (i.e., Palmer et al., 2023). In this qualitative case study, scholars found students engaged in land-based learning had a positive experience. Specific elements of the experience students noted as positive included being given agency to create consequential community change through land-based learning (Palmer et al., 2023). Additionally, participants noted land-based learning provided a context to implement and improve collaboration skills (Palmer et al., 2023). Finally, students identified land-based learning left a lasting impression on their perspectives, including a transformed view of their ability to create community change and a commitment to more active participation within the food system (Palmer et al., 2023). Findings from this case study provide support for continued utilization and evaluation of land-based learning. The current study heeds this call via a quantitative approach exploring complimentary outcomes.

Theoretical Framework

The framework being utilized in this research is land-based learning. Land-based learning scholars posit student learning gains and leadership development are likely outcomes of implementing this community-based and collaborative pedagogical approach (McKim et al., 2019). The land-based learning framework provides a guide for how these community-based collaborations unfold (see Figure 1).

Figure 1

The Land-Based Learning Model



Note. Conceptual model of land-based learning. Reprinted from "*Community as Context and Content: A Land-Based Learning Primer for Agriculture, Food, and Natural Resources Education*," by A. J. McKim, M. R. Raven, A. Palmer, and A. McFarland, 2019, *Journal of Agricultural Education, 60*(1), p. 176. Reprinted with permission.

First, students and teachers explore their community to *identify* a relevant phenomenon and partners (McKim et al., 2019). Seeking a community phenomenon (e.g., business, farm/ranch, recreation site) can be open or targeted based on the objectives of the learning experience. For example, in the application of land-based learning explored in the current study, students were directed to a local farmer pre-identified based on interest in selling their agricultural goods to the school cafeteria. After identification is *understanding* in which students seek to learn about the challenges and opportunities of the selected phenomenon (McKim et al., 2019). In the understanding stage, it is expected that learners will take field trips to the local phenomenon and the relevant community partners will engage as guest experts within the classroom. As mutual understanding grows, challenges faced by the local phenomenon will be discussed, leading to one challenge collaboratively selected by the students and community partners. Once the challenge is selected, the next stage of land-based learning is *intervention* (McKim et al., 2019). In this stage, students work with community members to gain a better understanding of the selected challenge, including the sustainability pros and cons of existing and innovative solutions to the challenge. This process leads students and community members to co-select and co-implement one intervention within the community phenomenon. The final stage of land-based learning is *evaluation* in which changes within the local phenomenon and interrelated systems are measured for evidence of social, ecological, and economic improvement, providing evidence of the intervention's efficacy (McKim et al., 2019). Land-based learning was initially designed to engage secondary school students (i.e., the population within the current study); however, may have utility for a broader range of learners.

Methods

The current analysis of land-based learning was completed using survey research methods. An online survey was used to collect data from students before and after participating in the land-based learning experience to provide insights into the efficacy of land-based learning as a pedagogical tool.

Study Context and Participants

This application of land-based learning took place within science classrooms at two high schools in Michigan's U.P. during the 2022-2023 school year. Funding to support this application of land-based learning was obtained through the United States Department of Agriculture (USDA) Food and Agriculture Service Learning Program. In total, participants engaged in land-based learning for an average of 20 class sessions. Participating teachers were provided a complete land-based learning curriculum (i.e., written by McKim et al., 2021), which included (a) four lessons building foundational food system understanding; (b) seven lessons building understanding of a local phenomenon (i.e., including selecting and proposing an intervention); (c) three lessons on grant writing associated with obtaining funding for their intervention, (d) five lessons for implementing and evaluating their intervention; and (e) one lesson devoted to exploring career opportunities within the food system. Importantly, teachers were given the flexibility to embed the 20 class sessions within additional coursework; therefore, completing the land-based learning was not done within 20 consecutive class sessions.

Students at both high schools engaged in land-based learning with the prescribed goal of increasing local food purchasing within their high school cafeteria. Students and community members worked collaboratively through the land-based learning process, including proposing their selected intervention via a mini-grant application reviewed by the project directors of the USDA grant. Students and community members at one high school proposed a hydroponic growing unit within the school to supply the cafeteria's salad bar. Students and community members at the other high school proposed a system to pipe heat from their school boiler room underground to a hoop house to extend the growing season and, thus, increase the capacity of the hoop house to supply the school cafeteria. Both proposals were accepted by the grant team and the student and community member teams implemented and evaluated their interventions with support from mini-grant funding. In both iterations of land-based learning, there were measurable increases in (a) local food purchased by the school cafeteria and (b) local food consumed by students within the cafeteria.

Population and Sample

The population for this study was high school students in the U.P. during the 2022-2023 school year. A sample was purposively selected that included students (n = 32) at two high schools in the U.P. enrolled in a science course. The students ranged from Freshmen to Senior status. The sample was selected because the two teachers in these classrooms had previously facilitated community-engaged, problem-based instruction (i.e., one previously facilitated land-based learning) and, thus, had familiarity with the approach. Of note, the two teachers taught within science as opposed to agriculture due to the absence of agricultural education programs in the U.P.. However, both science teachers regularly incorporated agricultural concepts into their instruction (i.e., including one offering a course titled Agriculture and Natural Resources).

Data Collection and Instrumentation

Prior to data collection, the Michigan State University Institutional Review Board reviewed all data collection plans and approved the study (i.e., MSU STUDY00005187). As a component of approval, parental consent was obtained for all students prior to their participation in the research. Data collection included two rounds, pre-experience and post-experience. Pre-experience data were collected before starting land-based learning via an online survey administered during a class session. Similarly, post-experience data were collected after the completion of land-based learning via an online survey administered during a class session.

The survey was identical for the pre-experience and post-experience administration. The survey included four sections. First, students responded to 10 research team-developed items comprising the Local

Food Awareness construct. Example items within this construct included "I can answer questions others have about locally sourced food" and "I know where to look for locally sourced food." A complete list of Local Food Awareness items can be found in Table 1, located within the findings. Second, students responded to seven research team-developed items comprising the Local Food Behaviors construct. Example items within this construct included "When buying food, I encourage my friends to purchase locally sourced items" and "In the future, I intend to purchase locally sources items." A complete list of Local Food Behaviors items can be found in Table 3, located within the findings. The third section of the survey included the 40-item Individual Leadership Factors Inventory (ILFI) which includes eight constructs: (a) empowerment efficacy, (b) determination, (c) communication, (d) decision making, (e) integrity, (f) impact, (g) confidence, and (h) empathy (Simonsen et al., 2013). The ILFI has been used in existing leadership education scholarship as a robust and comprehensive measure of leadership abilities (Simonsen et al., 2013). Across the first three sections, items were measured from one (*Strongly Disagree*) to six (*Strongly Agree*). The final section of the survey included limited demographic information, including year in school, general leadership participation in school, and past experiences with local foods.

Data Analysis

Pre-experience and post-experience data were retrieved from Qualtrics and analyzed using the Statistical Package for the Social Sciences Version 28. First, the 10 constructs of interest within the study were analyzed for reliability, using pre-experience data, with analyses supporting the reliability of all constructs (i.e., Local Food Awareness [Cronbach's alpha = .84], Local Food Behaviors [Cronbach's alpha = .82], and eight leadership constructs [Cronbach's alphas ranged from .83 to .94]). To accomplish the research objectives, pre-experience data for each construct were compared with post-experience data using a paired-samples *t*-test with a statistical significance level of $p < .05$ determined before analyses, the recommended approach for a pre- and post-experience study design (Salkind, 2010). For these analyses, effect sizes thresholds were established as "small effect," Cohen's $d = .20$; "medium effect," Cohen's $d = .50$; and "large effect," Cohen's $d = .80$ (Cohen, 1988). Given the novelty of the Local Food Awareness and Local Food Behaviors constructs, results from individual items for these two constructs are also reported within the Findings.

Findings

The first research objective focused on comparing local food awareness before and after engagement in the land-based learning experience. First, a comparison of pre-experience and post-experience data from individual items are presented given the novelty of the Local Food Awareness construct (see Table 1). This comparison highlights three dimensions of local food awareness in which participants experienced the largest gains: answering questions others have about locally sourced food ($\Delta = 1.73$), considering where food is grown or processed ($\Delta = 1.59$), and knowing where to learn more about locally sourced food ($\Delta = 1.43$). Data from the Local Food Awareness construct suggest consistent gains in local food awareness when comparing post-experience to pre-experience responses.

Table 1

Individual Item Comparison for Local Food Awareness

	Pre-Experience		Post-Experience		
Item	Mean	Standard Deviation	Mean	Standard Deviation	Change (Δ)
I can answer questions others have about locally sourced food.	2.91	1.49	4.64	0.99	1.73
When purchasing food, I consider where the food was grown or processed.	2.91	1.49	4.50	1.39	1.59
I know where to look to learn more about locally sourced food.	3.69	1.42	5.12	0.99	1.43
I understand how locally sourced food goes from the farm to my plate.	4.00	1.46	5.19	0.75	1.19
I know the benefits of purchasing locally sourced food.	4.59	1.32	5.65	0.56	1.06
I know where to look for locally sourced food.	4.59	1.24	5.23	0.65	0.64
I find it easy to purchase locally sourced food.	3.88	1.13	4.50	1.14	0.62
I know people in my community who produce food.	4.19	1.58	4.46	1.48	0.27
I am unsure how to get locally sourced food.[1]	3.03	1.43	2.35	1.38	-0.68
Where my food comes from is not something I consider when buying food.[1]	3.94	1.37	3.19	1.39	-0.75

Note. Items measured from one (*Strongly Disagree*) to six (*Strongly Agree*). [1]Items reverse-coded in final construct, but not reversed in current table.

In addition to individual items, summated Local Food Awareness pre-experience and post-experience data were compared (see Table 2). These data indicate the average Local Food Awareness score was a 3.85 ($SD = 0.94$) prior to engaging in land-based learning but rose to 4.75 ($SD = 0.68$) after completion of the land-based learning experience. This change in awareness was statistically significant (p-value < .001) with the Cohen's d (i.e., 1.10) suggesting participation in land-based learning had a "large" effect (Cohen, 1988) on participants' awareness of local food.

Table 2

Comparison of Local Food Awareness

	Pre-Experience		Post-Experience		*Paired-sample t-test value*	*p*-value	Cohen's *d* effect size
Construct	Mean	Standard Deviation	Mean	Standard Deviation			
Local Food Awareness	3.85	0.94	4.75	0.68	6.36	<.001	1.10

The second research objective entailed comparing local food behaviors before and after engagement in the land-based learning experience. Like the awareness construct, these data were first compared at the item level given the novelty of the Local Food Behaviors construct (see Table 3). Results

from this comparison suggest consistently increased local food behaviors. The largest changes in reported behavior were observed within encouraging family to purchase locally sourced items when buying food (Δ = 1.03), not purchasing locally sourced items (Δ = -1.02), and encouraging family to purchase locally sourced items in the future (Δ = 0.84).

Table 3

Individual Item Comparison for Local Food Behaviors

	Pre-Experience		Post-Experience		
Item	Mean	Standard Deviation	Mean	Standard Deviation	Change (Δ)
When buying food, I encourage my family to purchase locally sourced items.	3.16	1.48	4.19	1.50	1.03
In the future, I intend on encouraging my family to purchase locally sourced items.	3.81	1.36	4.65	1.35	0.84
When buying food, I encourage my friends to purchase locally sourced items.	2.88	1.41	3.65	1.52	0.77
In the future, I intend on encouraging my friends to purchase locally sourced items.	3.84	1.27	4.46	1.33	0.62
In the future, I intend to purchase locally sourced items.	4.22	1.34	4.73	1.22	0.51
When buying food, I purchase locally sourced items.	3.53	1.27	4.00	1.36	0.47
I do not purchase locally sourced items.[1]	3.37	1.45	2.35	1.09	-1.02

Note. Items measured from one (*Strongly Disagree*) to six (*Strongly Agree*). [1]Item reverse-coded in final construct, but not reversed in current table.

Next, the summated Local Food Behaviors construct data from pre-experience and post-experience collections were compared (see Table 4). Findings from this analysis illustrate local food behaviors averaged 0.57 higher post-experience (M = 4.60; SD = 1.27) when compared to pre-experience (M = 4.03; SD = 1.28). The difference observed was statistically significant (p-value = .023); however, the effect of the land-based learning experience on behaviors associated with local food (Cohen's d = 0.45) was categorized as "small" (Cohen, 1988).

Table 4

Comparison of Local Food Behaviors

	Pre-Experience		Post-Experience		*Paired-sample t-test value*	*p*-value	Cohen's *d* effect size
Construct	Mean	Standard Deviation	Mean	Standard Deviation			
Local Food Behaviors	4.03	1.28	4.60	1.27	2.43	.023	0.45

The third, and final, research objective focused on comparing leadership factors before and after engagement in the land-based learning experience (see Table 5). A total of eight leadership factors were considered and all saw increases between pre-experience and post-experience data collection (Δ ranged from 0.05 to 0.64). Only two of those increases, however, were statistically significant, the change in empowerment efficacy (p-value = .014) and the change in decision making (p-value = .047). Using

established effect size thresholds (Cohen, 1988), the change within empowerment efficacy was "medium," changes within six constructs were "small," and the change in integrity was "negligible."

Table 5

Comparison of Leadership Factors

	Pre-Experience		Post-Experience		*Paired-sample t-test value*	*p*-value	Cohen's *d* effect size
Construct	Mean	Standard Deviation	Mean	Standard Deviation			
Empowerment Efficacy	4.13	1.19	4.77	1.03	2.65	.014	0.58
Decision Making	4.56	0.95	4.97	0.76	2.09	.047	0.48
Empathy	4.79	0.58	5.09	0.74	1.90	.070	0.45
Impact	4.17	1.40	4.61	1.12	1.53	.140	0.35
Determination	4.76	0.96	5.01	0.77	1.43	.165	0.29
Confidence	4.57	1.00	4.84	1.14	1.44	.164	0.25
Communication	4.31	1.40	4.61	1.12	1.28	.214	0.24
Integrity	5.33	0.56	5.38	0.56	0.55	.587	0.09

Note. Items measured from one (*Strongly Disagree*) to six (*Strongly Agree*).

Discussion and Conclusions

Results from this study provide insights into student learning associated with participation in land-based learning. However, some limitations with the current study should be considered before further discussion of the results. These limitations include the number of students and schools engaged in the land-based learning experience. Only 32 students completed the experience across two schools, representing a significant minority of the population of high school students in Michigan's Upper Peninsula. Expanded implementation and evaluation of land-based learning is required to extend insights into the efficacy of this approach. In addition to the limited number of participating students, it is noted one of the two participating teachers had previous engagement with land-based learning and that may have influenced the data observed. The authorship team notes not all implementations of land-based learning will have teachers experienced in facilitating the process and, in those instances, recommend intentional training on land-based learning for teachers inexperienced with the approach. Acknowledging these limitations, the data from this study provide an encouraging initial quantitative analysis of student experiences in land-based learning.

Findings from the current study support existing scholarship highlighting observable gains in sustainability awareness associated with student participation in place-based education (Jennings et al., 2005; Webber, 2017). The current study supports the utility of place-based learning and builds upon that foundation to suggest land-based learning is a viable mechanism to enhance local food awareness. This finding is particularly salient given the need to engage youth in food system learning to increase their motivation and preparation to address current and future socio-ecological challenges throughout the food system (Bobronnikov et al., 2021). Furthermore, observing increases in local food awareness through participation in land-based learning highlights the potential to adapt land-based learning to specific learning outcomes. The implementation of land-based learning evaluated in this study was structured around local food purchasing in school cafeterias to achieve specified learning objectives related to food systems. Finding significant gains within the Local Food Awareness construct suggests instructional facilitators can tailor land-based learning to local food contexts, but also advances land-based learning as potentially adaptable to other contexts (e.g., social justice, natural resource preservation).

In addition to increasing local food awareness, findings indicate engagement in land-based learning had a positive impact on student behaviors associated with local foods. These behaviors included purchasing local food themselves as well as encouraging others (e.g., friends, family) to purchase local foods now and in the future. These data suggest the impact of participant engagement in land-based learning extends beyond understanding and into the domain of action. Thus, land-based learning should be seen as a pedagogical tool with the potential to change behaviors. Further scholarship is needed to identify the permanence of these behavior changes, but initial results are encouraging.

The findings associated with local food awareness and behaviors are clearer than the findings associated with leadership development. Findings associated with leadership development provide cautious support for place-based education scholarship finding this pedagogical approach is a tool for increasing leadership skills (Jennings et al., 2005; Rodriguez, 2008; Simpson, 2014; Sobel, 2005; Webber, 2017). While the findings associated with leadership development are not overwhelmingly conclusive, it was noted that the two areas of leadership in which statistically significant changes were observed (i.e., empowerment efficacy and decision making) are the two areas arguably most closely aligned to land-based learning. Empowerment efficacy is described as an individual's confidence in their abilities to empower others (Simonsen et al., 2013). Decision making is an individual's ability to engage in and effectively solve complex problems involving other people (Simonsen et al., 2013). We argue the land-based learning experience, involving collaborative decision making and implementation with community members, aligns with both empowerment efficacy and decision making. Thus, the nature of land-based learning may result in targeted leadership gains, like those observed in the current analysis.

Concluding that land-based learning results in targeted leadership development is supported by existing empirical work. Specifically, Palmer et al. (2023) found students noted decision making agency, collaboration, and consequential community change as positive elements of land-based learning. In combination, findings from the current study paired with existing scholarship (Palmer et al., 2023) imply facilitators of land-based learning can expect participants to develop leadership skills within targeted leadership factors like decision making, empowering others, and creating positive community change.

Recommendations

Synthesis of the findings and conclusions yield three salient recommendations for land-based learning, described below.

Expand Use of Land-Based Learning

The current study adds to the nascent body of philosophical and empirical research suggesting land-based learning is a valuable pedagogical tool. In the current study, growth in local food awareness, local food behaviors, empowerment efficacy, and decision making were identified, adding to the benefits expected from implementation of land-based learning. Based on these positive findings, we recommend increased implementation of land-based learning. Importantly, the onus of land-based learning implementation should not be shouldered by educators alone. Instead, we recommend the education system as a whole work in collaboration to support expanded land-based learning integration. As examples of this systems-approach, we recommend teacher educators integrate land-based learning within their preservice teacher education coursework; professional development facilitators seize opportunities to increase awareness of, and efficacy in, land-based learning; and school administrators provide resources for teachers to engage in professional development and land-based learning experimentation. In addition to a broad recommendation for increasing land-based learning, we also recommend scholars and practitioners continually highlight the potential flexibility of land-based learning to meet diverse educational outcomes.

Increase Funding for Land-Based Learning

In concert with expanding the use of land-based learning, there exists a need for funding to optimize land-based learning experiences. Land-based learning relies on active collaboration from students and community members, especially within the understanding phase of the process. To facilitate this collaborative understanding, financial support is often needed to transport students to farms and to support farmers engaging within classrooms. In addition to funding supporting the understanding phase, funding is commonly needed within the intervention stage of land-based learning. Within intervention, students select and implement a change within the selected agricultural phenomenon (e.g., new infrastructure, revised production methods, innovative marketing) that commonly requires financial resources. One proven method to make these resources available is through mini-grant funding accessible to teams of students, teachers, and community members. This method adds to the learning experience by having teams collaborate to propose their intervention for financial support. However, this approach requires funding available to support mini-grants. Therefore, we recommend stakeholders (e.g., Department of Education staff, policymakers, grant administrators, university faculty) seek opportunities to provide targeted funding to support land-based learning.

Continue Evaluations of Land-Based Learning

Finalizing the tripartite of land-based learning advancement are recommendations to enhance and expand scholarly evaluations. Three areas of focus are needed to inform the growth of land-based learning. First, scholarship is needed which explores an expanded implementation of land-based learning. As an example, scholarship exploring a statewide effort to incorporate land-based learning would provide insights into the inputs required to initiate successful land-based learning on a broader scale. Second, research is needed exploring the adaptability of land-based learning to contexts beyond food systems. For example, case study evaluations of the impacts from land-based learning implemented to increase social justice or natural resource conservation would inform the versatility of land-based learning within educational contexts. Third, investigating approaches to teacher training within land-based learning is required to illuminate what model(s) effectively prepare preservice and inservice teachers to implement land-based learning. Determining the approach, timing, and structure of land-based learning professional development will inform continued implementation of this unique pedagogical approach.

In closing, results from this study support land-based learning as an exciting new initiative with the potential to create positive learning gains among students. Therefore, we encourage expanded use, additional resources, and continued evaluations to elevate the impact of land-based learning for the betterment of students, teachers, community members, and communities.

References

Bobronnikov, E., Boyle, M., Grosz, M., Lipton, I., Nutter, R., Velez, M., & Yadav, L. (2021). *Farm to school literature review.* Abt Associates. https://ageconsearch.umn.edu/record/338161/files/FarmToSchoolBib2021.pdf?ln=en&withWatermark=1

Cannatella, H. (2007). Place and being. *Educational Philosophy and Theory, 39*(6), 622-632. https://doi.org/10.1111/j.1469-5812.2007.00319.x

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Erlbaum.

Feeding America West Michigan (2020). *The need by county.* https://www.feedwm.org/need/by-county/.

Gruenewald, D. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher, 32*(4), 3-12. https://doi.org/10.3102/0013189X032004003

Jennings, N., Swidler, S., & Koliba, C. (2005). Place-based education in the standards-based reform era – conflict or complement? *American Journal of Education, 112,* 44-65. https://doi.org/10.1086/444522

McKim, A. J., Palmer, A., McKendree, R. B. (2021). *Locally integrated food teams in the Upper Peninsula curriculum outline* [Unpublished curriculum]. Michigan State University.

McKim, A. J., Raven, M. R., Palmer, A., & McFarland, A. (2019). Community as context and content: A land-based learning primer for agriculture, food, and natural resources education. *Journal of Agricultural Education, 60*(1), 172-185. https://doi.org/10.5032/jae.2019.01172

Palmer, A. L., McKendree, R. B., McKim, A. J., Warsaw, P., Nettleton, M., Marzolino, T., & Brasier, H. (2023). Experiences from a land-based learning project focused on local food interventions. *Proceedings of the American Association for Agricultural Education Research Conference, Raleigh, NC,* 577-590.

Powers, A. L. (2004). An evaluation of four place-based education programs. *The Journal of Environmental Education, 35*(4), 17-32. https://doi.org/10.3200/JOEE.35.4.17-32

Rodriguez, A. (2008). *The multiple faces of agency: Innovative strategies for effective change in urban school contexts.* Sense Publishers.

Salkind, N. J. (2010). Pretest-posttest design. In N. J. Salkind (Ed.), *Encyclopedia of Research Design* (pp. 1087-1091). Sage Publications. https://doi.org/10.4135/9781412961288

Simonsen, J. C., Velez, J. J., Birkenholz, R. J., & McKim, A. J. (July, 2013). *How do you roll? Innovative practice for using the individual factors leadership inventory wheel.* Association of Leadership Educators Annual Conference. New Orleans, LA.

Simpson, L. B. (2014). Land as pedagogy: Nishnaabeg intelligence and rebellious transformation. *Decolonization: Indigeneity, Education, & Society, 3*(3), 1-25

Smith, G. A., (2002). Place-based education: Learning to be where we are. *Phi Delta Kappan,* 584-594.

Sobel, D. (1996). *Beyond ecophobia: Reclaiming the heart of nature education.* Great Barrington, MA: Orion Press.

Sobel, D. (2005). *Place-based education: Connecting classroom and community.* Great Barrington, MA: Orion Press.

US Census Bureau (2020). *Quick facts: Michigan: Alger and Marquette County, Michigan.* https://www.census.gov/quickfacts/fact/table/MI,algercountymichigan,marquettecountymichigan/PST045219.

Webber, G. (2017). *Intricate waters: A critical literature review of place-based education* [Unpublished master's thesis]. University of Saskatchewan.