2019-2020 PhysTEC Targeted Site Evaluation

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December 13, 2020
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About the study

This study investigated durable outcomes from the 8 Targeted Sites awarded in 2010 through 2013. Graduation rates were analyzed from 8 sites through 2019, and 6 participated in interviews and PTEPA data collection in June 2019.

About Targeted grants

Targeted RFPs were issued in 2010, 2011, 2012, 2013 to 8 institutions: Cal Poly Pomona, Chicago State, Central Washington, SUNY Geneseo, U. Wisconsin LaCrosse, North Carolina State, Cal State San Marcos, and Seattle Pacific University (SPU). SPU was not included in this study as PhysTEC staff considered its funding process to be anomalous; however it is included in the graduation rate analysis. The award amount was $75,000 over a 3-year period. Targeted site support included an annual site visit, monthly calls, TIR professional development, and attendance at the PhysTEC conference.

The Targeted sites were typically Primarily Undergraduate or Regional Comprehensive institutions, and all but one (North Carolina State) are BS-granting institutions. Targeted sites graduated 20 majors per year on average during 2014-2017; many graduated 30 or more majors/year, and only two (Chicago State and SPU) graduated fewer than 10 majors in a year (each graduated ~5/year).

Evaluation questions

This evaluation was driven by the following questions:
1. What was the impact of Targeted grants on physics teacher graduation rates, and how does this compare to the impact of other funding tracks?
2. How were structures, climate, and leadership affected at sites with Targeted grants?
3. Which of these features were sustained, and what factors contributed to this sustainability?
4. What are the features of thriving programs at smaller institutions?
5. What are reasonable expectations for PhysTEC interventions at smaller sites?

In general this study attempted to use an appreciative inquiry framework, identifying the positive outcomes and significant change stories from site leaders, including an understanding of how exemplary institutions succeeded to overcome challenges.

Data sources

1. Graduation Rates and related report (LINK)
2. Document review (RFP, proposals, site visit notes annual report)
3. Virtual site visits with Targeted site leaders in June 2019, including:
   a. Short written narrative about the most significant change, and sustainability.
   b. Interview with site leaders.
4. PTEPA Rubric results from participating Targeted site leaders.
One result of this work was that I recognized it would be valuable to have a portfolio or dashboard to keep track of outcomes at different sites, allowing easier aggregation across sites and a quicker understanding of an individual site. This led to the intensive development of data dashboards (now “Portfolios”) for the use of currently funded sites, using what was learned as information was gathered at Targeted sites. While the original intention was to log data from Targeted sites on this dashboard, this task ended up expanding into a separate project.

**Participation**
A total of 6 out of 7 eligible Targeted sites fully participated. All are Bachelor’s-granting institutions. However, graduation data was available for all 7 sites (from 2005-2019).

- Interviews: We spoke to site leaders at 6 sites; 3 of these were individual interviews with solo site leaders, and 3 were interviews with two site leaders (usually both in physics, but one included an education partner).
- PTEPA Rubric results: Gathered from these 6 sites.

Because IRB protects the confidentiality of those participating in interviews and providing PTEPA data, those institutions cannot be disclosed. Details about visit protocols can be found in the Appendix.

**Definition of period of funding.**
All graduation rate analyses use the “**Funded +1**” period defined as starting the first year of funding, and ending one full year after funding ends.

*Graduation results per year; grey dots indicate those with partial data.*
Current graduation rates

1. Gains during funding are positive.

Targeted sites increased their annual physics teacher graduation rates by +0.6 teachers on average from pre-to-during funding, with 5 sites (63%) experiencing increases. This increase is less than that for Comprehensive sites but is cost-effective and realistic for these smaller departments. However, most sites did not sustain these gains, as will be discussed later.

Results across grant types for different funding tracks rounded to the nearest decimal.

The two sites that experienced no net gains in teacher graduation rates are separated out (below; less successful sites), the overall upwards trajectory of graduation rates for the other sites is apparent, with graduation numbers diminishing in later years. Four out of 7 sites had a 4th year of funding. This three-year average smooths out fluctuations, but also means that post-funding year 4 is the first year that does not include rates from within the “funded +1” period.
2. **Sustainability post-funding is mixed.**

The sustainability of gains is more mixed. Investigating the during-to-post change in sustainability is not informative, as this includes sites that experienced zero gain during funding who maintained that zero gain. Investigating instead the sites which experienced positive gains during funding (N=5), only 2 were found to maintain that gain. The dip in graduation rates post-funding is apparent in the three-year rolling average as well, as the trend is downward starting in post-funding year 3.

3. **Net long-term gain only occurs for some sites.**

Regardless of whether gains made during funding were fully maintained, we can also investigate whether there is an overall net increase in graduation rates from pre-to-post funding. On average, there is only a total net gain of +0.2 teachers pre-to-post, which is indistinguishable from zero. Considering only those sites that experienced a net increase in graduation numbers pre-to-post (N=3; 57%), the net increase in graduation rates was +1.3 teachers. For these 3 sites this is a valuable result and has potential to address the national teacher shortage.

![Bar chart showing long-term change in graduates](chart1.png)

![Bar chart showing longer-term gains for sites with gains](chart2.png)

4. **Grants are only somewhat cost-effective.**

Because Targeted grants are low cost, a lower rate of success might be expected. In the full analysis of funded sites, I determined that the Targeted sites’ cost per year of teaching ($4702), and the investment risk of unsuccessful sites ($128,000), was close to that of the Comprehensive sites. Increasing the number of sites with positive long-term gains or increasing
the graduation rate at those sites with gains by +1 teacher/year, would result in significant cost-effectiveness.

<table>
<thead>
<tr>
<th>Average increase</th>
<th>Percent sites with gains pre-post funding</th>
<th>Cost per year of teaching</th>
<th>Investment risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive</td>
<td>0.6</td>
<td>$1,664</td>
<td>$180,750</td>
</tr>
<tr>
<td>Targeted</td>
<td>0.6</td>
<td>$4,702</td>
<td>$193,336</td>
</tr>
<tr>
<td>Recruiting</td>
<td>0.6</td>
<td>$6,432</td>
<td>$68,344</td>
</tr>
</tbody>
</table>

**5. Three sites appear to have exemplary performance**

It is informative to examine the outcomes of those sites which were more successful (e.g. experiencing gains) vs. those that did not in order to understand what characterizes these positive deviants. I base success on both the graduation rate and the long-term sustained increase in the graduation rate.

Based on graduation rates and sustainable change, three sites stand out as exemplary in their teacher graduation rates in terms of long-term graduation rates. The two sites with disappointing overall teacher graduation rates experienced idiosyncratic local influences (e.g. testing requirements, champion retirement) which depressed their numbers. The specific sites and their graduation rates are redacted for this public report. Because of small number fluctuations, I caution against putting much stock in these numbers (e.g. these should not be taken as indications of poor performance by these site leaders). However, this information will let us examine the sustainability interviews and PTEPA data for trends across more-successful and less-successful sites.

Notably, two of the most successful sites were featured in SPIN-UP as thriving programs and another has also been hallmarked by strong leadership and strength in the undergraduate program, and also became a UTeach replication site. On the other end of the spectrum, a poorer performing institution has operated under increasingly damaging licensure and state testing requirements, which served as a significant barrier to improvements to physics teacher education. Their lack of progress is so impacted by these state barriers that I did not attempt to further understand their situation. Another institution declined to participate in the study, but we do know that they lost their champion to retirement. Because lack of success seems related to idiosyncratic factors, the remainder of this report will thus focus on understanding the factors helping the most successful sites achieve success; the positive deviants.

In the remaining portion of the report, I will discuss results in the remaining two aggregated categories (most successful and mixed success) in order to preserve the confidentiality of interview and PTEPA data. This summary highlights the main conclusions from the PTEPA.
Program structures as they currently exist

A detailed analysis of Physics Teacher Education Program Analysis (PTEPA) rubric results led to the following findings for the current status of Targeted grants structures and activities.

1. **Overall PTEPA rubric ratings are strong.**
We find that Targeted sites exhibit overall patterns of strength which typically meets that of new Comprehensive sites, and substantially exceeds those of new Recruiting and Fellows sites. Thus, Targeted sites are mature programs with across the board strengths.

2. **There is the most strength in Institutional Commitment, Recruitment, and Assessment.**
Targeted sites exhibit particular strength in PTEPA Institutional Commitment (Standard 1; especially the component Institutional Climate and Support), Recruitment (Standard 3; especially the components Recruitment Activities and Early Teaching Experiences), and Assessment (Standard 6; especially the components Program Outcomes and Communication to Stakeholders).
3. **There is a strong physics program at most sites.**
While not directly measured, we have evidence that Targeted sites exist within strong physics programs. Mentoring and Community Towards Becoming a Physics Major (PTEPA Component 5A) achieved at least a Benchmark rating for all sites. Additionally, all three exemplary sites are at notably strong physics programs, either featured in SPIN-UP or hallmarked by strong leadership.

4. **Weaknesses are in Team Members and In-service Mentoring.**
The areas of the PTEPA which were not as strong were the component addressing Team Members; mostly due to the lack of a TIR or TAG. The component addressing in-service mentoring was also low, mostly due to the lack of interaction with alumni.

5. **Exemplary programs are higher rated in Institutional Commitment, including Rewards.**
The three exemplary programs only stood out in a few areas, with more consistently high ratings in the component Reward Structure (such as promotion and tenure, time to engage, and recognition for the team), and in general higher ratings across Institutional Commitment (Standard 1). Within Standard 6, the component Communication with University Administrators was also more well-rated (all 3 rated at least Benchmark). This suggests that the exemplary programs have their physics teacher education entrenched within a strong institutional climate, the program remains visible and streamlined, and they have good support from administrators. As noted above, these exemplary programs are also at notably strong undergraduate physics programs. However, it’s impossible to determine cause-and-effect relationships (e.g. whether their teacher graduation rates have led to, or are due to, administrative support). That said, most sites did not indicate that there were sustainable improvements made to Institutional Commitment as a result of PhysTEC, suggesting that Institutional Commitment pre-dated their success (rather than vice-versa).

6. **Exemplary programs also had a streamlined undergraduate program.**
**Time to Certification was well-rated for exemplary programs;** all 3 rated at least Benchmark on this item (candidates will complete the program in 5 years or less if they start as a junior). Exemplary programs were less likely to have post-baccalaureate certification routes (only 1 out of 3 had a post-baccalaureate route, whereas all 4 of the other programs did so).
Program structures that changed and were sustained

These results are based on interviews and ratings of improvement of PTEPA rubric categories.

1. **Recruiting was most often sustainably improved.**

   When asked which of the PTEPA Rubric areas were improved and sustained as a result of PhysTEC, each of the 6 standards was mentioned as having achieved sustainable improvements by at least one of the sites. The most sustainable improvements were made in Recruiting, with some additional improvements occurring since PhysTEC funding ended. Most of those changes were due to improvements in Early Teaching Experiences (primarily LA programs) and Recruitment Activities. This was mirrored in interviews where almost all sites indicated that the early teaching experience was the most significant change in their program and that this was a result of PhysTEC. Many also indicated that they recommended prioritizing early teaching experiences as a focus of a small grant.

![Graph showing favorable ratings](image)

**Program leader capacity was also sustainably improved.**

Communication to Stakeholders was also mentioned frequently as showing sustainable improvements, as were collaboration, resources, pedagogy, and other areas. In interviews, many leaders indicated that they were able to get additional funding to continue to enhance their programs, usually as a result of their experience with PhysTEC. Ongoing funding also supported ongoing collaborations with Education. In interviews, a strong consensus was that PhyTEC promoted a shift in identity and values for leaders (and their departments); they felt like they were part of an inclusive national community, got important recognition, and improved their own identity as a champion of physics teaching. The conference was a critical part of this shift. Several sites indicated that they recommend prioritizing the development of a capable champion as a focus of smaller grants like Targeted sites. Several also indicated that the reporting functions were useful (though onerous), although one felt that they could have made better use of formative data. I see these outcomes as indicating improvements to the leadership capacity and expertise at the site. Considering other results that Leadership and Collaboration is positively related to graduation rates, this is key.
Challenges to leadership remain.

However, there are key challenges to local leadership. In the PTEPA, Reward Structure (e.g. time to engage, recognition and promotion), and Program Team Members (number on the team) were very often noted as improved during PhysTEC but not sustained after funding ended. In practice, this was often because attention to physics teacher education waned, course buy-outs disappeared, and the TIR funding was no longer available. The most common challenge noted in interviews was keeping an engaged champion because attention is drawn to other priorities. Only one of the exemplary sites mentioned challenges with keeping an engaged champion, and by my estimation, that person is still quite engaged. A few sites indicated they didn’t have adequate person-power to carry the work, and I have observed that sites with more lackluster outcomes are often not carried by a strong team or engaged department. Thus, Targeted sites improve leadership capacity during the grant, but there are many critical challenges facing those leaders.

Teaching culture in departments was impacted.

Another strong theme in interviews was that the overall culture of teaching and learning in their department was supported by engaging with PhysTEC. “Prior to our participation in PhysTEC, the physics faculty were content to teach physics courses for the majors who want to become physics teachers and let the School of Education faculty advise students about teaching” said one site leader, explaining that now the department supports students interested in teaching. There was a sense among some site leaders that these cultural outcomes might not be valued by PhysTEC. Several commented that improvements to introductory courses or Learning Assistant programs may or may not lead to improved teacher graduation numbers, but it is something that the department and administration can support and creates a supportive environment for educating future physics teachers and hiring faculty who would also support those goals. Thus, supporting course reform, even tangentially, can support the goals of PhysTEC by helping to enhance the overall culture of teaching and learning and bootstrap other changes. At one site, for example, LAs allowed them to maintain their pedagogical innovations in the introductory course, and thus draw new hires among the faculty who were dedicated to active learning.

Clear, relevant focus was beneficial.

Many sites seemed to benefit from choosing a singular focus for their work and concentrating effort there (rather than trying to “do it all”). More scattered activity can result from trying to hit all the Key Components or engaging in activities that the champion isn’t excited about. Based on interview results, and PTEPA results, it is clear that there is no one-size-fits-all approach; a site must choose the focus that is most appropriate for their institution.
Summary and Discussion

Targeted grants achieve sustainable gains in teacher graduation rates, but the results are not robust across sites. When considering only net gains from pre-funding to the sustainability period, there is only a net positive long-term gain for less than half of sites (N=3)\(^1\). However, for those 3 sites, the average gain (+1.3 teachers) is a significant contribution to addressing the national teacher shortage. Based on graduation rates alone, I conclude that the Targeted grants contributed to sustainable increases in teacher graduation rates and that the investment was relatively cost-effective. However, these conclusions are based on small numbers, and could easily become less positive if graduation rates return to baseline in future years.

The Targeted grants had a strong reported impact on recruitment activities, a finding mirroring Scherr et al. (2014)\(^2\) which found that all Comprehensive sites with sustained gains had maintained a focus on recruitment. Many Targeted sites also reported the creation or strengthening of LA programs. Leaders noted that a focus on LA programs was beneficial because it strengthens the capacity of leaders, generates collaboration within and outside the department, organizational learning, and ultimately enhances the teaching culture of the department. The suggestion that LA programs enhance undergraduate teaching reforms, which ultimately enhance the sustainability of the program, is also mirrored in Foote and Knaub’s\(^3\) 2018 study of Comprehensive site sustainability, finding that course transformation was a critical element of long-term success. Additionally, site leaders noted that LA programs are broadly palatable to the department; a finding that mirrors those of Foote and Knaub (2018) and Scherr et al. (2014)\(^4\) showing that PhysTEC activities that fit within the routines and value system of the department are more likely to be sustained. The lack of sustainability of Teachers in Residence at Targeted sites is likely because it has not been framed in a way to fit inside normal departmental responsibilities.

In this way, an LA program or other introductory course reforms might be considered a “touchstone” intervention with a ripple-effect that enhances many elements of a program in ways that can enhance teacher preparation, even if indirectly. I suggest that there might be other such “touchstone” interventions that are appropriate for different institutions.

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\(^1\) This differs from the “hit rate” reported in the Funded Site Graduation study due to the interpolation of pre-funded graduation rate for SUNY Geneseo’s outlier year in this study.


Targeted sites exhibited relative strength in **Institutional Commitment** (particularly climate and support for physics teacher education), and this was especially true of the exemplary sites. Targeted sites also tended to exist within strong physics programs, and this was even more often the case for the three exemplary sites. Exemplary sites also reported greater rewards for the PTE team (e.g. time to engage and recognition), and enhanced communication with administrators. However, institutional commitment was typically not reported as having improved as a result of PhysTEC, suggesting that these structures formed a pre-existing supportive climate for teacher preparation. This finding mirrors that of Scherr et al. (2014) and Foote and Knaub (2018) studies of Comprehensive site sustainability, indicating that institutional commitment (both financial and intellectual/cultural) is important in sustainability. Overall these findings suggest that it is important to select for, and to build, a strong institutional climate for physics teacher education, and that this includes helping to support a thriving physics program, not just a thriving physics teacher program.

PhysTEC clearly supported **capacity building** for teacher preparation in terms of enhanced collaboration, strategic planning, and a shift in identity and values for leaders and their departments. All exemplary sites had a committed and capable **champion**. This finding again mirrors that of Foote and Knaub (2018) that a respected change agent at the university (i.e. a champion) is a critical factor in sustainability, and they emphasized that the champion must have adequate authority and respect. They found that sites that struggled with the sustainability of the PhysTEC outcomes had champions that did not occupy formal leadership positions. However, I would like to emphasize that -- in addition to the presence of such a champion --

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Targeted sites attributed their success to the capacity of that champion and the organizational learning and culture which surrounded that champion. They also attributed their challenges to these same factors. All lost their TIR, which reduced the size and engagement of the team and thus their organizational capacity. Lack of person-power was a common challenge at sites. The site leaders’ attention was drawn to other priorities. Positional power was often a detriment in this regard as chairs juggle multiple priorities.

Exemplary programs also had a streamlined undergraduate program, suggesting that in cases where this doesn’t exist, it may be difficult to recruit adequate numbers of students to teaching.

Recommendations to increase percent of sites with gains

Based on these results, I suggest the following recommendations for the future. Overall, I believe a reasonable goal for improvement would be to increase the percent of sites with long-term gains, rather than to increase the gains themselves. Those sites with gains had an average of +1.2 teachers, which is appropriate.

1. Continue to offer Targeted grants, but at reduced funding rates and longer duration.

These are cost-effective grants but could be even more so with reduced funding rates, based on results at Recruiting grants. It takes time to establish changes in culture and capacity (Standard 1 and 2), and an additional year of funding (or partial funding) could help establish these structures more firmly and perhaps increase the number of sites with sustained gains. For these smaller grants, site selection should probably include an assessment of whether there is capacity to enhance the strength of Standards 1 and 2 (Institutional Commitment / Leadership and Collaboration) but I don’t believe it would be prudent to only select sites that already have this strength.

2. Offer strategic long-term engagement, including PhysTEC conference attendance, virtual site visits, and smaller follow-on grant opportunities.

Given the strong impact of the conference on maintaining and enhancing leader identity and capacity, I believe it is imperative that legacy site leaders be able to attend one conference every 2-3 years without cost, perhaps through an application process. Access to travel funds is particularly important for smaller institutions such as Recruiting and Targeted sites. I also believe that offering small follow-on grants might be valuable (e.g. to employ a TIR for one year, or pay for a workshop). Community-building opportunities could be cost-effective, such as a “Targeted Site Leadership Academy.” Virtual site visits for legacy sites would also be impactful; either from PhysTEC PMT or other legacy site leaders. (Other ideas will be explored as part of a table discussion at the 2021 PhysTEC Conference.) Consider framing PhysTEC engagement as a subscription model, to build habits and reduce the cognitive load of learning, as described in this article on Innovation Subscriptions.
Change-making for individuals, organizations, and communities alike comes through the enactment of **habits**. Once a behaviour becomes consistent and persistent the effort required to engage in it declines and the easier it becomes to do. In some cases, it becomes unconscious – we just do it. In groups or organizations this is what we call **culture**.

*By making innovation feel like a singular event — like doing a training ...— we fail to subscribe... A **subscription** is a system that creates regularity that reduces your attention costs.*

3. **Strategically align with other programs aiming to improve physics department strength.**

Given that institutional commitment and physics department strength were common among the most successful Targeted grants, this ought to be an area of focus for supporting smaller grants. It shouldn’t simply be a selection consideration, but PhysTEC ought to work strategically with other programs developing strong physics programs (e.g. EP3, TEAM-UP are both creating cohorts of departments to work on key issues). For example, a physics program that has gone through such strengthening (through EP3, for example, or those with LA programs) might be directly solicited to apply for a PhysTEC grant to continue to synergistically build their culture of teaching and learning. Another example is to consider expanding Get the Facts Out to include materials for other careers in physics.

4. **Suggest sites focus their activity on a single key intervention with “ripple effects” for department climate for physics teacher education.**

LA Programs were impactful because they strengthened champions’ capacity to lead change, enhanced collaboration with Education, and had impacts that the department faculty cared about (i.e. undergraduate success). LA Programs are not the only interventions which can achieve these goals. For a small grant, and smaller site team, choosing a focused activity that hits several goals in one, while building departmental engagement, is reasonable. Sites may need some assistance in choosing these activities, perhaps in the format of pre-proposal “coaching” (which has been done in the past) or discussions.

5. **Include funding for program evaluation dedicated to each site.**

I feel that many of these outcomes could be better supported with more formative evaluation capacity at each institution. Currently the PhysTEC evaluation occurs at the project level, but evaluation time could also be dedicated at each institution level (e.g. collecting and interpreting local data such as graduation rates and PTaP, engaging in collaborative sensemaking and strategy based on local goals, interviewing and/or surveying local stakeholders and students), akin to a Noyce grant evaluation. Engagement of the evaluator at individual sites would help build local capacity in formative assessment and strategy, and also fulfill a request from site leaders that they be assisted in tracking outcomes other than graduation numbers. The Portfolios are a step in the right direction in this way, as are discussions about assessment...
during video conferences, but evaluation expertise could be of great assistance to these small sites. Other ideas to support program assessment include:

- Asking site leaders to complete the Program Sustainability Assessment Tool each year. [https://www.sustaintool.org/understand/](https://www.sustaintool.org/understand/).
- Budget for PhysPort to build PTaP and PTaP.HE analysis into their Data Explorer.
- Plan an annual “data summit” for all legacy sites to review data, analysis, consider steps, and share ideas.
Appendix 1: PTEPA analysis and interviews

**PTEPA Rubric: What were the areas of strength?**

Below I report the PTEPA rubric data for the 6 Targeted sites completing the rubric and the interview in 2019. All six sites were bachelor’s granting institutions (either Primarily Undergraduate or Regional Comprehensive institutions), and all but one reported departmental graduation rates in the 4th national quartile (9+ students/year).

Full PTEPA data is shown in the Appendix and in more detail in the [State of the PTEPA 2020](#) report. Sites report several areas of strong ratings, particularly in Standard 3 (Recruitment) and Standard 4 (Knowledge and Skills) -- see Appendix. However, these ratings are more informative when compared to other benchmarks.

**Targeted site PTEPA ratings are similar to new Comprehensive sites.**

Comparing to the new Comprehensive site ratings, we find that Targeted site ratings (graphic below; yellow bar) generally track fairly close to those new Comprehensive sites (black bar). Targeted site ratings are quite a bit higher than new Fellows or Recruiting site ratings. Since Fellows and Recruiting sites also tend to be Bachelor’s granting institutions, the higher ratings of Targeted sites may demonstrate the more mature nature of those programs.

![PTEPA Ratings per Standard](#)
Targeted site ratings are particularly high in Institutional Commitment, Recruitment, and Program Assessment.

When comparing to other types of sites, the Targeted Site ratings on those three standards (Institutional Commitment, Recruitment, Assessment) do not track the general trend (see above; note that the yellow bar is sometimes higher and sometimes lower than its neighbors). Below I compare specifically to the new Comprehensive sites so that we can see whether Targeted sites have achieved growth relative to those newer sites. Targeted sites achieve higher ratings on those three standards than would be expected compared to the trend observed on the other three standards. This could also be interpreted that Targeted sites have particularly low ratings on the other standards. These results generally hold true regardless of which site type we compare Targeted sites to (with the exception of the Thriving programs, which have relatively higher ratings on Standards 5 and 6 than other sites).

Targeted site ratings are high across the board within a standard, with particular strength in 1A, 3B, 3C, 5A, 6A and 6C.

Investigating these results at the Component level (below and next page) shows that ratings in these standards tend to be fairly high across the board, though 1A (Institutional Climate and Support), 3B (Recruitment Activities), 3C (Early Teaching Experiences), 6A (Program Outcomes) and 6C (Communication to Stakeholders) rise to the fore as strong compared to other components and other types of sites (not shown). Component 5A (Mentoring and Community towards becoming a Physics Major) is also quite high, suggesting that these sites also exist within a thriving physics department.

The only components which look relatively weak are 2A (Team members), usually due to the lack of a TIR or TAG, and 5C (In-Service Mentoring).
The three exemplary sites have higher ratings in Reward Structure (particularly recognition for PTE team), Time to Certification, and Communication with University Administrators.

In order to determine if the PTEPA ratings provided any explanatory power about why three of the sites were more successful than others, I compared the PTEPA results by components aggregated across these three sites, compared to the other four targeted sites.

The results were almost identical in most components with the exception of Reward Structure (component 1B; 78% of items rated at least Benchmark at the most successful sites, versus 33% at the other sites). In fact, 100% of items were rated at least Benchmark in this component for two of these three sites, whereas for the non-exemplary sites the majority of items were rated at Developing level. Items in Reward Structure include credit towards promotion and tenure for PTE activities, time for program leaders to engage, and recognition for the PTE team. There was also a pattern of response such that more items within Institutional Commitment (Standard 1) were highly rated for the exemplary programs than for the other programs.
At the item level, the exemplary programs tended to have more numerous favorable ratings than the other programs in the following areas:

- **Time to certification** (3D-3; 100% Benchmark for exemplary programs; 67% Developing for non-exemplary)
- **Recognition for PTE team** (1B-3; 100% Benchmark for exemplary programs; 67% Developing for others)
- **Communication with university administrators** (6C-2; 100% Benchmark or Exemplary for exemplary programs; 67% Developing for others)

The three exemplary sites are less likely to have a post-baccalaureate pathway, and less likely to have high ratings in Recruiting.

These exemplary programs had fewer favorable ratings than other programs in a few areas, such as program space, and accurate information about career benefits. Most of these item-level discrepancies seem idiosyncratic, but I highlight a few of potential interpretive importance below:

- **Absent post-baccalaureate certification** (present at only 1 out of 3 exemplary programs, but at all 4 of the others)
- **Low diversity of physics teacher candidates** (Developing at only 1 out of 3 of the exemplary programs; Exemplary at all 4 of the other programs). However, these programs are mostly in states with low diversity, and physics programs with low diversity.
- **Fewer Recruiting items highly rated.** There was also a pattern of response such that fewer items in Recruiting were highly rated for the exemplary programs.

**PTEPA Rubric: What were the areas of growth?**

Site leaders were asked to rate each of the PTEPA Rubric items as to whether they had changed since the ending of the PhysTEC grant. Because their approach to this question was very idiosyncratic, the results should be taken as suggestive rather than definitive.

Options included:

- No change (which could include that there was no impact on the item during the grant)
- Improved and sustained
- Improved and not sustained
- Improved since PhysTEC as a direct or indirect result of the project.

The chart below shows the favorable ratings across standards, averaged across sites.\(^6\)

\(^6\) For this calculation, the aggregated percent is the same as the average percent across sites. (Due to a large number of items in a standard, those that were rated “not sustained” averaged only 2% of ratings and are not reported).
Sustainable improvements were made in all standards - particularly Recruiting.

While not all sites reported improvements in all standards, each standard showed at least some sustainable improvement during the grant, or after the grant. The most improvements during, and since, funding were in Recruitment. All sites reported some sustainable improvements in Recruitment. Many also reported improvements in Assessment.

Very few improvements were made in Mentoring and Community, and those mostly by a single site. Thus, the strength in Mentoring and Community across Targeted sites are largely not seen as being a result of PhysTEC.

Most of these improvements are due to changes in Recruitment Activities and Early Teaching Experiences.

To identify the origin of these improvements at the standard level, I investigate results by components. By far the greatest improvements made in 3C (Early Teaching Experiences) and 3B (Recruitment Activities), with Component 6C (Communication to stakeholders) also showing sustainable improvements.

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Because each component has fewer items, a change in rating of a single item will result in a larger percent change in that component. Ratings are again an average across sites of the percent of items rated at that level.
Sustainable improvements were also made in the following areas.

<table>
<thead>
<tr>
<th>Component</th>
<th>Improved &amp; Sustained</th>
<th>Improved since PhysTEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 2C: Program Collaboration</td>
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<td>Component 1C: Resources</td>
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<td>Component 3A: Recruitment Opportunities</td>
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</tbody>
</table>

Modest numbers of sustainable improvements were made in the areas below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 6A: Program Outcomes</td>
<td>29%</td>
</tr>
<tr>
<td>Component 2A: Program Team Members</td>
<td>25%</td>
</tr>
<tr>
<td>Component 5A: Mentoring Toward a Physics...</td>
<td>25%</td>
</tr>
<tr>
<td>Component 5B: Mentoring Toward Becoming...</td>
<td>23%</td>
</tr>
<tr>
<td>Component 2B: Program Team Attributes</td>
<td>23%</td>
</tr>
<tr>
<td>Component 4A: Physics Content Knowledge</td>
<td>22%</td>
</tr>
</tbody>
</table>

**Few sustainable improvements were made in Streamlined Program Options, among others.**

The areas below represent the least progress towards sustainable improvements. These are scattered across the different PTEPA standards without a clear pattern. There was not much improvement in component 3D, which includes the undergraduate pathway, time to degree, the existence of a post-baccalaureate pathway, and financial resources. However, most ratings (75%) were at least Benchmark for undergraduate pathway and time to degree, and so perhaps few improvements were needed.
Areas that were not sustained were Rewards, Resources, and Team Members.

When investigating components with items that were rated as “not sustained”, three components rise to the fore: Reward Structure (1B; 22% of items rated as not sustained), Program Team Members (2A; 13% of items not sustained), and Resources (1C; 7% not sustained). Full data is in the Appendix.

PTEPA Rubric: Summary and synthesis

In this section I present a brief synthesis of these findings, along with description of types of changes reported by site leaders. A detailed summary table is available in the Appendix.

Recruitment (Standard 3) is the strongest area in the rubric, with the highest sustainability. Many sites mentioned sustainable improvements to the ability to advise student as to licensure requirements, usually due to the site leader’s enhanced expertise. Many sites also mentioned sustainable improvements to early teaching experiences (3B) mostly related to LA programs. However, changes to streamlined licensure pathways were notably absent. The three exemplary sites less frequently had strong ratings across items in Recruitment -- with the exception of Time to Degree.

While Institutional Commitment (Standard 1) is strong at Targeted Sites, this is typically not the result of sustainable improvements from engagement with PhysTEC. Visibility and funding are sometimes maintained, but rewards and resources are commonly lost post-PhysTEC, primarily in terms of time to engage (such as course release or service credit), loss of recognition, and loss of the PhysTEC funding. The three exemplary sites tended to have more favorable item ratings in this standard, particularly in Reward Structure and Recognition for PTE Team.

Program Assessment (Standard 6) is another overall area of strength, with particular strength in Program Outcomes (6A) and Communication with Stakeholders (6C). Communication with Stakeholders was also the strongest area of sustainability -- most sites reported sustained
improvements in this area, though details were not provided. Exemplary programs particularly reported numerous favorable ratings in Communication with Administrators (6C-2).

Collaboration with Education (2C) is often mentioned as sustainably improved as a result of PhysTEC through formal or informal structures - including advising and meetings. Ongoing funding streams (Noyce, UTeach) supported these collaborations.

Mentoring and advising of physics teachers (5B) showed some sustainable improvements, often due to improved knowledge of licensure requirements. This outcome is more apparent through reading site leaders’ responses than in the rating graphics above. In-service mentoring (5C) was generally not strongly rated, and showed low sustainability of improvements.

Leadership (2A and 2B) could be stronger, both in terms of overall ratings and sustainability -- especially given the finding from regression studies that this standard is related to graduation rates. Program team (2A) has loss of sustainable items in large part due to the loss of the TIR.

Few improvements were noted in Knowledge and Skills (Standard 4); only a few sites included revisions to physics or pedagogy courses.

**Interviews: What were the important outcomes from PhysTEC?**

In interviews and short written narratives, the 6 participating sites were asked to reflect on (1) the most significant change in their program, and (2) aspects of their PhysTEC were sustained or not.

**Most common changes were an LA program, and future funding.**

In a casual coding of responses, 5 (out of 6) indicated that their LA program, or other early teaching experience, was a significant change in their program. “The LA Program has had widespread support of faculty and administrators because of the impact it has had on STEM learning environments at the university,” stated one leader. Thus, while LA programs can betime-intensive to develop, and do not always lead directly to enhanced teacher recruitment, they may be part of an overall boost to cultures of teaching and learning at the institution.

Additionally, 4 indicated that they were able to get additional funding (Noyce, MSTI, UTeach) to continue to enhance their program, often as a result of their experience with PhysTEC.

**Another common change is some aspect of program culture.**

A total of 5 sites indicated some change in the program culture, including an enhanced culture of teaching and learning in physics (2 sites) or of teacher preparation (3 sites), or enhanced collaboration with Education (3 sites). “Prior to our participation in PhysTEC, the physics faculty were content to teach physics courses for the majors who want to become physics teachers and let the School of Education faculty advise students about teaching,” said one leader, explaining that now such interested students are better supported in the program.
The most common *challenge* is keeping an engaged Champion (but less so at exemplary sites.)

Four of the sites indicated that maintaining the engagement of the Champion has been challenging because their attention is drawn to competing priorities -- especially given the multiple responsibilities of those in positions of power, or at primarily undergraduate institutions. "I feel like I am spread too thin to do what a champion should do: Be a loud voice for PTE" explained one. Only one of the exemplary sites indicated that having a strong champion was a difficulty: However, interviews made it clear that that site is still relatively well-engaged (e.g. visiting local schools, acting as college liaison for the program), and the departmental faculty are also supportive of teacher education.

**Other significant changes are varied across sites**

In reviewing responses no other obvious patterns arise. Some sites hired faculty to help with teacher preparation; others lost them. Some created a new pathway for teacher candidates; others failed to do so. Some lost funding, or experienced external threats. Some enhanced their advising, and others lost advising structures. No sites maintained a Teacher in Residence, and most struggled to use them effectively during the grant. One indicated that building a community for students was critical; others indicated that creating a pathway was the most important. I was not able to identify clear patterns for the exemplary sites. Thus, the significant changes established by PhysTEC are as diverse as the participating sites.

**Sites recommended prioritizing Early Teaching Experiences, and Champions**

Interviewees were also asked, with the benefit of hindsight, which of the Key Components they felt were most important to prioritize for a smaller site. Only 5 sites responded to this question. The areas that were recommended to prioritize are listed below:

1. Early teaching experiences / LA program: 4
2. Champion: 3
3. Mentoring, Pedagogical content knowledge, Collaboration with education: 2 each
4. Assessment, Community, Recruitment, Teacher in Residence: 1 each

These results are as interesting for what is *not* a consensus for prioritization as for what is: Collaboration with education, Recruitment, and TIRs are not typically seen as critical areas of focus.

**Site experiences with PhysTEC, and suggestions for future**

In the spirit of Appreciative Inquiry, we asked sites to describe what was their “best experience” in PhysTEC, and what they “value about what happened at their institution” as a result of PhysTEC. We also asked them what recommendations they had for supporting smaller institutes.
PhysTEC promotes a shift in identity and values for departments and leaders.

One common theme among sites was that PhysTEC provides a supportive *national* community, and that engaging in PhysTEC helped leaders to create a positive *local* culture for physics teaching. Representative comments included:

- The PhysTEC community is an inclusive nationwide community, with opportunity to learn from one another -- especially at the conference.
- Institutions engaged in PhysTEC get promoted by PhysTEC, and leaders get recognition, which helps them to raise visibility and value of physics teaching. Site visits are valuable.
- One site especially noted that this promoted their own value of physics teaching as champions: “Our department established this as something we care about. Before we said we valued it, but didn’t act on it in concrete ways. (PhysTEC) committed us to doing that and we have continued to chart that course with specific programs.”

In general, the grants seemed to promote an identity of “being a part of PhysTEC,” which promoted value for physics teaching, and an identity for champions and their departmental faculty that they are a part of PhysTEC. The conference is often cited, as well as travel opportunities for students -- and it is unfortunate that many targeted sites no longer have funding to attend the conference. Providing conference funding would be an important way to maintain engagement for legacy sites.

Learning Assistant programs and introductory courses are seen as critical to departmental culture shifts, which help maintain PTE efforts. There is a sense that PhysTEC values graduation numbers over such outcomes.

Across several sites, there was a theme that shifts in the overall culture of teaching and learning was supported by PhysTEC, and that this was critical for maintaining physics teacher education programs. A few specifically mentioned that they felt sustainability of the relationships, engaged champions, and culture change were most important for their institution, but that PhysTEC might not value those outcomes. Improvements to introductory courses, or to Learning Assistant programs, provide a foothold for faculty and administrators to support the program and for a variety of STEM majors to be attracted to teaching -- even if it doesn’t translate directly into teacher graduation numbers. As one leader said, “Implementing an LA program is good for a lot of reasons. It’s not totally focused on physics teacher prep, it has broader goals that serve the department that they can get behind. Another thing is that when you’re building an LA program you have to think about your institution’s strengths and essential elements of the model as a guide.” And another noted, “For a smaller program, depending on the institution and their needs, they have to focus on limited items [like an LA program] that have a bigger impact than just teacher recruitment. Something you can pull in other people in the department who care about student outcomes...Nobody objects to the LA program. They have different ways to understand why it’s good.” Another indicated, “Sometimes I feel PhysTEC is too focused on the numbers. Look at other elements: We see other impacts happen as a result of PhysTEC.” At one site, for example, LAs allowed them to maintain their pedagogical innovations in the introductory course, and thus draw new hires among the faculty who were dedicated to active learning. “This was a
big deal," said one faculty member who was hired at this time, “my priority was to be at a department that had a teaching focus.” That faculty member has helped to push forward teacher education efforts in this exemplary department. “Departments are more likely to grab onto [introductory course reforms] because the increase in the number of teacher graduates isn’t really that helpful for the department,” explained her colleague. This site also mentioned that a strong introductory course will also help the non-physics STEM majors learn physics well enough to teach it.

Several sites mentioned that they needed more person-power.

One leader mentioned that they probably didn't do a good job bringing other people on board, and a site really needs a few dedicated people to carry forward the work. This matches my casual observations that sites with a single champion seemed more likely to turn their attention to other priorities once the grant ended (in Targeted and in Recruiting grants), whereas those with a few champions or an engaged faculty body maintained momentum. One site lamented not having gotten a TIR to help with the work -- though another that did have a TIR indicated they didn’t know how to use them and it was not money well-spent.

Choosing one main focus seems to be seen as most feasible.

While not always explicitly mentioned, many sites seemed to benefit from choosing a singular focus for their work as a Targeted site, be it an LA program, an outreach effort, or a TIR. Some sites felt they needed to hit all Key Components, since we know they are all important, and that resulted in scattered activity. One site pins their success on choosing one strategy that they were excited about, and were able to maintain post-grant. One leader felt strongly that the choice of a particular strategy must vary from site to site.

Reporting was seen as burdensome, yet useful

One common theme was that there was a lot of reporting required given the size of the grant -- yet people indicated that the reporting was mostly useful. One mentioned that PhysTEC staff clearly read the reports. It took time to learn how to track and report teacher graduates in particular, but it was also seen as in line with what is required for Noyce grants. One mentioned that they felt they weren’t making adequate use of formative data, such as exit surveys or other methods to better understand what actually did recruit students to their program. Thus, it may be valuable to also emphasize data sources other than graduation numbers to support these formative choices. Perhaps future evaluation could allot some budget to conducting formative interviews with students and alumni at sites.
Appendix 2: PTEPA results

PTEPA results from Targeted sites (N=6) are compared to Thriving programs. Shown is the percent of items rated at each level.

**Standards**

**Targeted sites (N=6)**

<table>
<thead>
<tr>
<th>Standards</th>
<th>NOT PRESENT</th>
<th>DEVELOPING</th>
<th>BENCHMARK</th>
<th>EXEMPLARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Institutional Commitment</td>
<td>5%</td>
<td>33%</td>
<td>41%</td>
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</tr>
<tr>
<td>2. Leadership and Collaboration</td>
<td>17%</td>
<td>16%</td>
<td>35%</td>
<td>32%</td>
</tr>
<tr>
<td>3. Recruitment</td>
<td>14%</td>
<td>16%</td>
<td>32%</td>
<td>38%</td>
</tr>
<tr>
<td>4. Knowledge and Skills for Teaching Physics</td>
<td>9%</td>
<td>19%</td>
<td>38%</td>
<td>34%</td>
</tr>
<tr>
<td>5. Mentoring, Community, and Professional Support</td>
<td>18%</td>
<td>34%</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>6. Program Assessment</td>
<td>16%</td>
<td>26%</td>
<td>33%</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Thriving sites (N=8)**

<table>
<thead>
<tr>
<th>Standards</th>
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<th>DEVELOPING</th>
<th>BENCHMARK</th>
<th>EXEMPLARY</th>
</tr>
</thead>
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<td>2. Leadership and Collaboration</td>
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</tr>
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<td>4. Knowledge and Skills for Teaching Physics</td>
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<td>48%</td>
</tr>
<tr>
<td>5. Mentoring, Community, and Professional Support</td>
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<tr>
<td>6. Program Assessment</td>
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<td>7%</td>
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## Components

### Targeted sites

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<td>1B: Reward Structure</td>
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<tr>
<td>1C: Resources</td>
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<td>37%</td>
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<td>2A: Program Team Members</td>
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<td>2B: Program Team Attributes</td>
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<tr>
<td>3C: Early Teaching Experiences for Recruiting Teacher Candidates</td>
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<td>25%</td>
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<tr>
<td>4A: Physics Content Knowledge</td>
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<td>4B: Pedagogy Courses and Curriculum</td>
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<td>4C: Practical K-12 School Experiences</td>
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<tr>
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</tr>
<tr>
<td>6B: Program Evaluation and Improvement</td>
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<tr>
<td>6C: Communication to Stakeholders</td>
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**Thriving sites (N=8)**
<table>
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<th>Category</th>
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<td>Recruitment Opportunities</td>
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<td>Early Teaching Experiences for Recruiting Teacher Candidates</td>
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<td>Streamlined and Accessible Program Options</td>
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<td>Communication to Stakeholders</td>
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## Sustainability

Components rated as not sustained (average percent of items)

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<tr>
<th>Component</th>
<th>Percent</th>
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<tr>
<td>Component 1A: Institutional Climate and Reward Structure</td>
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<tr>
<td>Component 1C: Resources</td>
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<td>Component 2A: Program Team Members</td>
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<td>Component 3B: Recruitment Activities</td>
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<td>Component 3C: Early Teaching Experiences</td>
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<td>Component 3D: Streamlined and Accessible</td>
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<td>Component 4A: Physics Content Knowledge</td>
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<td>Component 4B: Pedagogy Courses and Practical K-12 School</td>
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<td>Component 6A: Program Outcomes</td>
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<td>Component 6B: Program Evaluation and Communication to</td>
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</table>

### PTEPA Synthesis table

**Bold** indicates the strength of the relationship stated, and **blue text** indicates losses or weaknesses.
<table>
<thead>
<tr>
<th>Overall strength or weakness</th>
<th>Sustainability or loss</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1: Institutional Commitment</strong></td>
<td></td>
</tr>
<tr>
<td>Overall strength across the standard (especially Institutional Climate; 1A)</td>
<td>Visibility and funding sometimes cited as sustained. Lower sustainability across the standard. Institutional Climate (1A) and Rewards (1B) have few positive reports of sustainability, and Rewards (1B) and Resources (1C) report losses of sustainability -- primarily in terms of time to engage, and loss of recognition and funding.</td>
</tr>
<tr>
<td><strong>2: Leadership &amp; Collaboration</strong></td>
<td></td>
</tr>
<tr>
<td>Weakness in Program Team Members (2A)</td>
<td>Modest sustainability across the standard, particularly in Collaboration with Education (2C). Many sites mentioned improved formal and informal relationships with Education, including changes of licensure or clearer advising. Noyce or other grants maintained that collaboration. Program team members (2A) were generally not sustained, usually due to loss of the TIR.</td>
</tr>
<tr>
<td><strong>3: Recruitment</strong></td>
<td></td>
</tr>
<tr>
<td>Overall strength in standard, especially Recruitment Activities (3B) and Early Teaching Experiences (3C).</td>
<td><strong>Highest sustainability of all standards.</strong> One common improvement discussed was improvements to advising and mentoring, usually due to expertise gained by the site leader. The other was the addition or improvement of an LA program. Less commonly improved were Streamlined Program Options (3D).</td>
</tr>
<tr>
<td><strong>4: Knowledge &amp; Skills</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Lukewarm results in this area. Modest sustainability across the standard. In general few improvements were noted, primarily a few revisions to pedagogy or methods courses, or strengthened introductory courses due to the LA program.</td>
</tr>
<tr>
<td><strong>5: Mentoring &amp; Professional Community</strong></td>
<td></td>
</tr>
<tr>
<td>Strength in Advising toward Physics Degree (5A). Weakness in In-Service Mentoring (5C).</td>
<td>Modest sustainability in Mentoring toward becoming a Physics Major (5A) and Teacher (5B). Several sites note improvements to the advising and mentoring process due to better knowledge of licensure requirements -- this is not well-captured in the sustainability numbers. In-service mentoring (5C) did not have broad sustainability.</td>
</tr>
</tbody>
</table>
### 6: Program Assessment

| Overall strength in standard, especially Program Outcomes (6A) and Communication with Stakeholders (6C). | Modest sustainability across the standard, mostly due to enhancements in Communication to Stakeholders (6C). Details on the enhanced communication were not given, but most sites reported this. Few sustainable improvements in Program Evaluation (6B) were noted. |
Appendix 3: Virtual site visit protocols

Invitation letter

Dear PhysTEC site leader,

As the past recipient of a PhysTEC Targeted Site award, we need your assistance in evaluating the impact of these awards. Such assessment will help us to effectively seek future funding (indeed, this evaluation was requested by the NSF), as well as to make appropriate modifications to our current programs which offer only modest amounts of funding.

Thus, we would like to ask for your participation during Spring 2019 in an in-depth evaluation of the sustainability and long-term impacts of the Targeted Site awards by our external evaluator, Stephanie Chasteen.

If you agree, you will be asked to complete a rubric (at phystec.org/thriving) which describes activity at your site, and participate in an interview about your experiences and the rubric results. In return, we will provide a snapshot of activity at your site, including visuals of data collected and reflection on possible next steps. Many sites have found the Rubric to be immensely helpful for identifying how their teacher education programs might be improved, and for garnering support from institutional and external stakeholders. These activities might require 4-6 hours of your time. Participation is voluntary, and results will be confidential to the evaluator.

Please let Dr. Chasteen know if you would be willing to participate. If you are willing to participate, please let us know if you have a preference for the timing of your interview. In-person interviews may be possible at the PhysTEC conference, or the March or April APS Meetings, so please let us know if you plan to attend any of those events.

Best,
Monica Plisch

--
Dr. Monica Plisch
Director of Education and Diversity
American Physical Society

Site narrative and journey mapping

Site leaders were asked to complete this in advance of the interview. The site timeline was added based upon site documentation.
Three-Question Narrative
Please write a short narrative that addresses these 3 questions.

During the last 10 years, in your opinion, what was the most significant change that took place in the physics teacher education program? What made that change possible? Please be specific.

What were the main things that were, or were not, sustained at your physics teacher education program since PhysTEC funding ended? What were the main factors that facilitated or impeded sustainability?

- Tangible program elements? (e.g. courses, staff positions, licensure program)
- Less tangible elements? (e.g. collaborations, culture, learning, norms)

In past evaluations, targeted site leaders indicated that they needed help prioritizing which Key Components to address. Now that you have the benefit of hindsight, what Key Components (or PTEPA Rubric Elements) do you feel were the highest priority for your program?

Site timeline
Please review the timeline of critical events in the lifetime of your program.
Fill in and modify as appropriate.

Example:

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Added BA teaching option. Faculty XYZ hired.</td>
</tr>
<tr>
<td>2012</td>
<td>New grant for in-service teacher training.</td>
</tr>
<tr>
<td>2013</td>
<td>PhysTEC funding received</td>
</tr>
<tr>
<td></td>
<td>Science Methods course reformed.</td>
</tr>
<tr>
<td></td>
<td>Added science/math ed seminar</td>
</tr>
<tr>
<td></td>
<td>TAG group established</td>
</tr>
<tr>
<td>2015</td>
<td>PhysTEC funding ended</td>
</tr>
</tbody>
</table>
Interview protocol

1/ Journey Mapping

Look at site timeline together.

2 / Most significant change

Site narrative:

**Most significant change.** Discuss their responses to the most significant change questions (what was the most significant change? What made that possible? What was sustained? What components were most important in hindsight? What factors facilitated or impeded sustainability? Probe as to whether the activities aligned with the department priorities.)

**PhysTEC.** Thinking about PhysTEC, what was your best experience in your PhysTEC program? What were the two main high points or greatest moments? What do you value about what happened at your institution as a result of engagement with PhysTEC? (Appreciative inquiry)

3 / PTEPA

Look at overall visuals if we have them and talk about areas of weakness and specific growth.

**Standard 1**

Do you have any questions or places you would like to discuss? Which of these are most significant growth for your site, or the biggest disappointments? (Flag for discussion later if another person will be joining)

- What contributed to this growth or lack of growth?
- Which were sustained or not sustained?
- What facilitated or impeded sustainability?
- Which of these feel that they do not apply or need to be modified for your institution?

This was repeated for each standard.

**Reflection**
What were your main challenges in achieving these positive outcomes? Where could it have all gone wrong and how did you avoid failure?

What suggestions do you have for the PhysTEC program for supporting smaller sites like yours, now that you have the benefit of hindsight? What types of activities are reasonable, feasible, and generate momentum?