AP Teacher Perspectives on Project-Based Learning in the Knowledge in Action Curriculum:
Key Findings from Teacher Survey Study

July 2015
Table of Contents

Introduction..........................................................................................................................................................1
AP Teacher Perceptions..................................................................................................................................3
The Knowledge in Action Project-Based Learning Curricula.................................................................6
AP Teachers Reactions to the Curriculum..........................................................................................7
Conclusion.....................................................................................................................................................11
Appendix........................................................................................................................................................12
Appendix B.....................................................................................................................................................13

Acknowledgements

This executive summary is based on research gathered from Interactive Educational Systems Design Inc., and the report titled Project-Based Learning for AP Courses: Teacher Perspectives, May 6, 2015.

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Expectations for all students are on the rise and demands of college and workplace in the 21st century call for successful students to have both breadth of knowledge and depth of understanding. In high schools throughout the United States, AP courses are the flagship curricula for advanced study and each year record numbers of students take and pass the AP exams. But are these courses designed to prepare students for the needs of tomorrow?

A 2002 report by the National Research Council makes the case that learning must involve application by students in the context of authentic activities. This is necessary to prepare students to later apply what they learned in real situations. This research about learning and program design indicates that advanced study must promote development of deep conceptual understanding by students, as well as develop their ability to apply knowledge appropriately through learning with understanding. This type of study develops a students’ ability to evaluate the relevance of particular knowledge to new problems they will encounter, and gives them the valuable experience of explaining and justifying their own thinking.

In 2015, the College Board began a process of evaluating and redesigning AP courses and exams to meet future needs and match best practices in college-level learning. Key features of the redesign include: Greater emphasis on discipline-specific inquiry, reasoning, and communication skills; Curricula that strikes a balance between breadth of content coverage and depth of understanding; Connections to key learning objectives and conceptual understanding; and Exam questions tied to learning objectives.

The Knowledge in Action project set out to support these improvements to student learning across the country by providing teachers with tools to transform their instruction — in the form of practical, research-informed curricula that incorporate principles of effective teaching to achieve deep understanding.

As a first step, project-based learning curricula for AP Environmental Science and AP U.S. Government and Politics courses was developed and refined for use by teachers. This curriculum was completed with sponsorship by Lucas Education Research and led by a team from the University of Washington LIFE Center working in partnership with professionals from several school districts.

Effective implementation is necessary to motivate student learning and this curriculum requires substantial content knowledge and teaching expertise on the part of educators. In order to provide support for teachers using the Knowledge In Action curricula, Lucas Education Research conducted a study to better understand who are the teachers of AP Environmental Science and AP U.S. Government and Politics, and what types of things could help them create successful instruction for project-based learning in their classrooms.

Two surveys and two online discussion groups were conducted for this research. AP Environmental Science and U.S. Government and Politics teachers identified by The College Board volunteered to participate in Survey 1. Those who completed the survey were then asked to take part in Survey 2.

The online discussion groups were divided into two groups: AP Government and Politics and AP Environmental Science teachers. Discussion group participants were determined by their responses to a particular question in Survey 2.

This study finds teachers interested in a well-conceived project-based learning approach to AP instruction. Many teachers see the potential for such an approach and are eager to try it in their own classes. In the pages that follow we give details from the study and indications for future next steps to transform teaching in a way that powerfully impacts the ability of young people to apply what they learn to new challenges in their daily lives, college studies, and professional careers.
Research about the experiences and attitudes of AP teachers related to project-based learning suggests that they are interested in a well-conceived project-based learning approach to AP instruction—one that will lead to deeper student understanding and increased engagement while maintaining high levels of performance on the AP tests. Many AP teachers see the potential for such an approach in the Knowledge in Action AP Environmental Science and AP U.S. Government and Politics courses—an approach they are eager to try in their own classes.

However, in order for the Knowledge In Action curricula to be successful, course developers will need to find the right balance between content depth and breadth, provide for sufficient teacher professional development, and build in enough flexibility for AP teachers to make the courses fit local circumstances. Additionally, while most AP teachers already have experience with project-based learning, in order to successfully implement the Knowledge In Action curricula, they will need to embrace an approach that is substantially different from their prior experience in that projects are not simply a component, but the major way that content is taught—the “spine” of the course.

Questions remain about how well the Knowledge In Action curricula will help prepare students for the AP exams, and about how specific elements of the Knowledge In Action project-based learning curricula will be implemented by teachers within their individual AP classrooms across these two courses. Additional research is planned to address these questions.

“When they finish the project, it will set the ideas in their brains and lives so much more than reading the book or listening to a lecture. The ideas will be real.”

“I have known for a long time that PBL is much more intellectually engaging, not only for students, but for myself.”
Passionate, Empowered, and Interested in Project Based Learning

The survey found that while AP teachers vary widely in their instructional settings and circumstances, most AP teachers are well qualified and experienced professionally. They have confidence in their teaching skills. Their motivations for teaching AP courses suggest openness to “raising the bar” with respect to AP course rigor, depth of student learning, and expectations for student work. Survey participants describe themselves as open to new instructional approaches, however many teachers will want to see such approaches in action before trying them out.

The participating teachers represent a breadth of different instructional contexts (see Appendix). They come from large and small districts and large and small schools; from states and regions across the United States - urban, suburban, and rural places; and from schools with students at high poverty levels and low poverty levels.

Across both subjects, about three-fourths of the teachers were from schools where all students are eligible to enroll in AP courses as space allows — as opposed to schools with selective enrollment, where only qualified students are eligible to enroll in AP courses.

Asked to identify the aspects of teaching that led them to become AP teachers, three-fourths or more of the teachers in both subject areas reported that they have a passion for their subject, value engaging students in deeper learning experiences, and enjoy working with students who like to be academically challenged. Less than 15% said I was assigned to the AP course and did not volunteer.

Findings from the surveys suggest that a majority of AP teachers in both subject areas are empowered to make their own decisions about the curriculum they use in their AP courses.

Across both subject areas, almost half of the AP teachers had been teaching for 6-15 years total, and most of the rest had been teaching 16-25 years. However, 57% of the Environmental Science teachers and 51% of the U.S. Government and Politics teachers had been teaching their specific AP course for 5 years or less. Most of the rest had taught the AP course for 6-10 years. More than three-fourths have at least a master’s degree.

Asked about their key strengths as a teacher, more than two-thirds of the AP teachers across both subject areas said that presenting/demonstrating content and skills and guiding student growth were key strengths. About two-thirds of the Environmental Science teachers and half of the U.S. Government and Politics teachers identified designing learning experiences and facilitating individual/group work as key strengths. In contrast, about 70% of the U.S. Government and Politics teachers but less than half of the Environmental Science teachers said that leading and moderating class discussions was a key strength.
Teachers report a substantial openness to considering new approaches. Prior to learning about the Knowledge in Action curricula, teachers selected statements that best describe their attitudes toward new instructional approaches. Most teachers in both subject areas identified themselves as either early adopters or fast followers.

Most AP teachers report being knowledgeable about project-based learning and already using many of its practices — although not generally to the extent called for in the Knowledge in Action curricula. These teachers acknowledge the strengths of project-based learning, but are also aware of the challenges it presents—particularly in an AP context. This prior experience with project-based learning will certainly inform their reactions to any new curriculum.

Across both groups, about half of the teachers said their courses—including AP and non-AP courses they teach—typically include some project-based learning. Most of the rest called project-based learning a regular and important component of the courses they teach.

### Prior experience informs perceptions of student benefits and instructional challenges

Teachers typically described project-based learning in terms of students learning content through participation in projects that feature: hands-on learning, learning through experience, and/or learning by doing. Learning was typically framed as taking place in response to an authentic or real-life challenge, question, or scenario — which students then investigate in their attempt to solve, answer, or take action. Teachers emphasized the importance of student roles in the learning process, including collaborative group work.

Teachers’ ideas about project-based learning paralleled their prior experiences using it in their own classes. Teachers in both groups typically establish the focus of their project by posing an authentic question or problem. Students work in collaborative groups to collect data and/or find information related to the research question or problem. According to most teachers, students are primarily responsible for planning and implementing their projects — with redirection as needed from the teacher, who acts as a facilitator. Student learning is then assessed through authentic tasks, typically culminating in a final student product that is presented to the class.
Most teachers in both groups also reported that they assign projects lasting longer than a week, with almost half of the AP Environmental Science teachers but only about one-fourth of the AP U.S. Government and Politics teachers reporting that they assign projects lasting at least a month.

Across both subject areas, about two-thirds of the teachers who use at least some project-based learning in their courses identified greater student engagement as one of the benefits. Teachers also saw benefit from students seeing the relevance of what they’re learning, deeper student understanding, and (particularly in the case of AP Environmental Science) improved problem-solving skills. About three-fourths of the AP Environmental Science teachers and about 60% of the AP U.S. Government and Politics teachers thought a project-based learning approach would have a positive impact on their AP students. Teachers also identified challenges related to project-based learning — most notably, time pressure to cover required content. Many teachers also found that “What might take me a day to teach in a more didactic approach, might take several days of class time in PBL.” Students sometimes focus on completing the project and not on understanding the underlying content. Lack of teacher planning time is another substantial challenge faced by some teachers.

“What might take me a day to teach in a more didactic approach, might take several days of class time in PBL.”

### Project-Based Learning in AP Courses

**Effectiveness of PBL for subject area teaching: (ratings of 4 & 5)**

- Environmental Science: 83%
- Government & Politics: 64%

**Impact of PBL on AP students:**

- Environmental Science: 78%
- Government & Politics: 58%

**Effectiveness of PBL to prepare for AP Exam:**

- Environmental Science: 60%
- Government & Politics: 48%

According to AP Government and Environmental Science teachers...

- Prior PBL practice has been associated with improved student engagement, relevance for students, deeper understanding, and improved problem-solving skills
- Prior challenges with PBL implementation include time pressure to cover content and finding well-designed projects that align to course content
Design principles were selected to shape the scope and sequence, lesson materials and teacher supports for both courses, “see Appendix B”. These four principles are adapted from Parker, et al, 2013.

**Knowledge In Action AP U.S. Government and Politics**

Organized around a sequence of five project cycles, students investigate “What is the proper role of government in a democracy?” During the course of these projects, student collaborative tasks include: simulations, debates, and challenges. Each concept is revisited in project activities where students take on roles that help deepen their understanding.

Student learning focuses on key concepts: limited government; separation of powers; constitutionalism; civil rights and liberties; and linkage to institutions such as political parties, elections, and media.

**Knowledge In Action AP Environmental Science**

Organized around a sequence of six project cycles, students investigate “How can we live more sustainably?” The projects start with a personal focus on individual student action and over the duration of the course students have multiple opportunities to reflect on the role of the individual and the community in living more sustainably.

Throughout the course, students collaborate with a focus on six unifying themes: (1) science is a process; (2) energy conversions underlie all ecological processes; (3) the Earth itself is one interconnected system; (4) humans alter natural systems; (5) environmental problems have a cultural and social context; and (6) human survival depends on developing practices that will achieve sustainable systems.
Across both subjects, most teachers reacted positively to the Knowledge in Action curriculum; More specifically, they thought it would have a positive impact on student attitudes, and expressed an interest in implementing it. They were more hesitant to think the Knowledge In Action curriculum would prepare students well for the AP exam. Teachers who reported being more open to adopt new instructional approaches were also more likely to react positively to the Knowledge in Action curriculum.

Across subject areas and teacher characteristics
- AP Environmental Science teachers were more likely than AP U.S. Government and Politics teachers to react positively to the Knowledge in Action curriculum.
- Teacher reactions to the Knowledge In Action curriculum did not significantly differ based on whether enrollment in AP courses was open or selective in their school, district size, or free/reduced lunch status.

“The suggested projects and content organization hit upon key components of the AP curriculum.”

**Overall Survey Findings**

<table>
<thead>
<tr>
<th>Environmental Science: Percent Positive Response</th>
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<tbody>
<tr>
<td>Feasibility to implement</td>
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<tr>
<td>Preparing for the AP exam</td>
</tr>
<tr>
<td>Interest in implementing</td>
</tr>
<tr>
<td>Impact on student attitudes</td>
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<tr>
<td>Overall reaction</td>
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</tbody>
</table>

<table>
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<tr>
<th>US Government &amp; Politics: Percent Positive Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility to implement</td>
</tr>
<tr>
<td>Preparing for the AP exam</td>
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<tr>
<td>Interest in implementing</td>
</tr>
<tr>
<td>Impact on student attitudes</td>
</tr>
<tr>
<td>Overall reaction</td>
</tr>
</tbody>
</table>

**Recognition of potential for student involvement and learning**

Teachers across both groups reacted positively to the overall structure of the Knowledge in Action AP curricula.

**What Did AP Teachers Like Best?**
- Master question for the course
- Organization around key curriculum themes
- Looping of key concepts across projects
- Design of specific projects
- More active and experiential learning
- Open questions to prompt student thinking
- Potential for greater student involvement
- Presentations demonstrating application of learning

Use of a master question and key themes were seen as having the potential to unify the content of the curriculum for students and help them understand the purpose of what they’re learning. Looping of key curriculum concepts that are revisited within and across projects was particularly valued by teachers for its potential to help students relate the different concepts to each other. Teachers in both courses noted the importance of helping students “develop an understanding of how all of the themes . . . are interrelated.”
Teachers liked the specific projects provided in each course and anticipated that the curricula would transform student experiences within their AP courses in promising ways. They approved of the focus on active/experiential learning, with teachers asking open questions to prompt student thinking, and with students demonstrating application of what they learned through presentations in which students “get a deeper understanding because they have to, in essence, teach the material.” Teachers across both subjects saw this kind of curriculum as having the potential to generate greater student involvement. For example, one teacher commented, “Greater student involvement and ownership of the course should increase student interest, and therefore learning.”

Student AP exam performance represents an important bottom line concern for AP teachers. Overall, survey results showed many teachers were skeptical that the Knowledge In Action curricula would prepare students well for the AP exam. Among teachers who were interested in implementing the curriculum, about one-third expressed this opinion. One teacher questioned, “whether this method is capable of covering the full scope of content information covered in the AP exam. I’d love to think that it does but I’d have to see some more data or test the method myself to be certain of it.” Another predicted, “If students aren’t doing well on the AP exam having taken this course, I don’t know how long it will last in our school since the current AP class prepares the students quite well for the exam.”

A possible complicating factor for AP U.S. Government and Politics is the prevalence of single-semester courses which intensify the challenge of covering all of the required content. More than one-third of the AP U.S. Government and Politics teachers said that in order to successfully implement the Knowledge in Action curriculum, they would need to expand this course to a full year.

More than one-third of the AP U.S. Government and Politics teachers also had concerns about projects serving as the “spine” of the courses, compared to a generally positive view of this aspect among AP Environmental Science teachers.

Concern about exam performance and time constraints
Teachers generally liked the areas of content focus for the Knowledge In Action courses. However, many were concerned about the challenge of covering all of the AP curriculum content in the time available, reflecting a common perception that “PBL seems to absorb more time than the traditional approach to covering material.”

Feasibility for Adoption
About two-thirds of the AP Environmental Science teachers and a little less than half of the AP U.S. Government and Politics teachers thought that the Knowledge In Action curricula would be feasible to implement in their courses.

Students asking their own questions — Across both subject areas, a majority of the respondents were confident in supporting
students in asking their own questions. One-fourth of the teachers in each subject area identified this as one of the aspects of the curriculum that had the most potential to improve their AP course – and about the same number of teachers identified this as a feature of concern. One teacher noted, “I think that in the beginning there would be some resistance from the students, as they seem to want to be told information. However, I think that once they got used to finding/discovering for themselves, they would enjoy class more.”

Finding appropriate student information sources

Across both subject areas, less than half of the teachers thought that finding appropriate information sources for students to complete the projects would be easy to implement. Members of the discussion groups hoped that the curricula would include resource recommendations, or that an item bank of possible information sources might be provided.

Supporting students with reading and writing difficulties — Across both subject areas, about 40% of the teachers thought it would be easy to support students with reading and writing difficulties in implementing the Knowledge In Action curricula. One teacher observed, “These projects are based on the assumption that students have some basic reading and research skills that my students do not possess.”

Public audiences for project presentations

Teachers were relatively unenthusiastic about the educational value of public audiences —with 57% of the AP Environmental Science teachers and 42% of the AP U.S. Government and Politics teachers stating that they thought it would be helpful to student learning. Almost half of the teachers in both groups raised concerns about recruiting public audiences for student presentations, and half or more in both groups thought arranging for public audiences would be difficult to implement. Even among teachers who were interested in implementing the curriculum, more than 40% shared these concerns. Areas of concern expressed by individual teachers included the logistics of arranging for public audiences, local policies about classroom visitors, finding stakeholders who are willing to make the effort, and finding “authentic audiences year after year when doing the same projects.” Teachers in both subject areas also expressed concerns about involving public audiences for topics that are locally controversial.

Assessment tools are needed

Teachers confirmed that assessment represents an important part of any project based learning experience for AP students—including the Knowledge in Action curricula. Rubrics were seen as especially important to project success, not only for use by teachers but also to provide students with clear expectations for their projects. Teachers wanted more traditional assessment resources for a mostly project-based learning AP course, both in order to test student learning of the curriculum content and to help prepare students for the AP exam. A majority of the teachers in both groups thought that multiple choice/short answer quizzes, essay questions, and rubrics would all be useful resources for program implementation.
**Professional Development**

Professional development support for serving as a project facilitator was identified as a specific need by about half of the teachers in both groups. Professional development would ideally have teachers completing project activities as students, providing a chance to view sample lessons and student products, or both. Most AP Environmental Science teachers and about half of the AP US Government and Politics teachers in the online discussion groups specified that initial support sessions should take place over several days. Teachers wanted an opportunity to communicate with others implementing the curriculum, potentially through an online discussion board or social media.

“*I would still want to have a traditional assessment, such as a test, to make sure that the sum total of information that the scope of the project covered had been attained. There is a way to gloss over things during a project that may make it seem like there is understanding, but in reality there is little. I would definitely want a final check for understanding.*”

**Flexibility in topic and project choice**

Feedback from the online discussion groups suggested that many teachers would want or need to make changes in the Knowledge In Action curriculum projects in order to implement the projects in their own courses. Teachers cited a variety of reasons for making such changes: choosing topics of local relevance; the need to adjust topics and timeline in response to local climate conditions, election cycles and other current events; and demands of the local school calendar. U.S. Government and Politics teachers in particular wanted teachers to have the flexibility to choose from among multiple project options. Still others thought they might need to add “side units, or . . . special review sessions” to provide additional support in areas where students might lack content knowledge they would need for the AP test.
Conclusion

Research about the experiences and attitudes of AP teachers related to project-based learning suggests that they are interested in a well-conceived PBL approach to AP instruction—one that will lead to deeper student understanding and increased engagement while maintaining high levels of performance on the AP tests. Many AP teachers see the potential for such an approach in the Knowledge in Action AP Environmental Science and AP U.S. Government and Politics courses—an approach they are eager to try in their own classes. However, in order for the KIA curricula to be successful, course developers will need to find the right balance between content depth and breadth, provide for sufficient teacher professional development, and build in enough flexibility for AP teachers to make the courses fit local circumstances. Additionally, while most AP teachers already have experience with project-based learning, in order to successfully implement the KIA curricula, they will need to embrace an approach that is substantially different from their prior experience in that projects are not simply a component, but the major way that content is taught—the “spine” of the course.

Questions remain about how well the KIA curricula will help prepare students for the AP exams, and about how specific elements of the KIA PBL curricula will be implemented by teachers within their individual AP classrooms across these two courses. Additional research is planned to address these questions.

Going Forward

What are the next steps for the Knowledge in Action AP curricula?

Concurrent with the release of this report, more detailed findings from the teacher research are being shared with the Knowledge in Action developers, the implementation and rollout team, and the College Board. During the 2015-2016 school year, a pilot will be conducted using the KIA AP Environmental Science and AP U.S. Government and Politics curricula—to find out more about how the curricula can be implemented under a variety of different circumstances, and to field test instruments for an efficacy study. In 2016-2017, a study is planned to verify the impact of the KIA AP Environmental Science and AP U.S. Government and Politics curricula on student learning—including performance on the AP exam. It is expected that these findings and the finalized curricula will be made available for use by teachers throughout the United States at the completion of the study.

In addition to the AP Environmental Science and AP U.S. Government and Politics curricula, a Knowledge in Action curriculum is in development for AP Physics 1. More information about a timetable for release of that curriculum will be shared as plans proceed.

For more detailed findings from the teacher research summarized in this report and for ongoing information about the Knowledge in Action AP initiative from Lucas Education Research, visit www.edutopia.org/research.
### Who Are the AP Teachers and Where Do They Teach?

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<th></th>
<th>Environmental Science</th>
<th>U.S. Government &amp; Politics</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td>•&lt;1%: Under 24 years old</td>
<td>•&lt;1%: Under 24 years old</td>
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<tr>
<td></td>
<td>•17%: 25-35 years old</td>
<td>•17%: 25-35 years old</td>
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<td></td>
<td>•43%: 36-50 years old</td>
<td>•49%: 36-50 years old</td>
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<td></td>
<td>•38%: Over 50 years old</td>
<td>•33%: Over 50 years old</td>
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<tr>
<td><strong>Gender</strong></td>
<td>•67% Female</td>
<td>•52% Male</td>
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<tr>
<td></td>
<td>•33% Male</td>
<td>•48% Female</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<td>•92% White, Non-Hispanic/Latino</td>
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<td><strong>Education</strong></td>
<td>•74% Master's Degree</td>
<td>•71% Master's Degree</td>
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<td></td>
<td>•6% Doctoral Degree</td>
<td>•22% Bachelor's Degree</td>
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<td></td>
<td>•21% Bachelor's Degree</td>
<td>•7% Doctoral Degree</td>
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<tr>
<td><strong>Region</strong></td>
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<td>• Mid Atlantic: 15%</td>
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<td></td>
<td>• Midwest: 13%</td>
<td>• Midwest: 21%</td>
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<td></td>
<td>• Northeast: 9%</td>
<td>• Northeast: 6%</td>
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<td></td>
<td>• Southeast: 29%</td>
<td>• Southeast: 25%</td>
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<td></td>
<td>• Southwest: 10%</td>
<td>• Southwest: 7%</td>
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<td></td>
<td>• West: 22%</td>
<td>• West: 26%</td>
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<tr>
<td><strong>District enrollment size</strong></td>
<td>• Large districts (10,000+ students): 40%</td>
<td>• Large districts (10,000+ students): 35%</td>
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<td>• Midsized districts (2,500-9,999 students): 26%</td>
<td>• Midsized districts (2,500-9,999 students): 30%</td>
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<tr>
<td></td>
<td>• Small districts (less than 2,500 students): 28%</td>
<td>• Small districts (less than 2,500 students): 28%</td>
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<td></td>
<td>• Don't know: 6%</td>
<td>• Don't know: 7%</td>
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<td><strong>School enrollment size</strong></td>
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<td>• More than half from schools with &lt;1,500 students</td>
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<td></td>
<td>• The rest from schools with 1,500-3,999 students</td>
<td>• The rest from schools with 1,500+ students</td>
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<td><strong>School metro status</strong></td>
<td>• 59% Suburban Schools</td>
<td>• 58% Suburban Schools</td>
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<td></td>
<td>• 22% Urban Schools</td>
<td>• 23% Urban Schools</td>
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<td></td>
<td>• 19% Rural Schools</td>
<td>• 19% Rural School</td>
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<td><strong>School free/reduced lunch status</strong></td>
<td>• 10% or fewer: 24%</td>
<td>• 10% or fewer: 21%</td>
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<td></td>
<td>• 11% to 20%: 12%</td>
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<td>• 21% to 30%: 7%</td>
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<td></td>
<td>• Don't know: 12%</td>
<td>• Don't know: 13%</td>
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5 Total is less than 100% due to rounding.
6 Some teachers didn’t know their district enrollment size.
7 Total is less than 100% due to rounding.
8 Total is more than 100% due to rounding.
Appendix B

Key Curriculum Design Principles PBL

1) Projects as the Spine of the Course
A key distinction for this curriculum is making the project the centerpiece of the course, “providing its spine, not the appendages.” This is preferred to the experience where the project is an add-on following other course delivery.

2) Building Depth Through Looping
With this method, students move through the project and revisit and loop back on the master question and ‘try again’ to generate a response, reflecting on what they have gleaned earlier. Projects are united by a course master question and repetitive activity cycles give students opportunity to revisit questions, ideas, and problems throughout the course. This deepens learning and student understanding of the course topics. As with expertise in any domain, this method grows understanding with repeated practice under novel conditions and with feedback.

3) Engagement That Leads to a ‘Need to Know’
This principle leads to course design where students are engaged in project work prior to delivery of textbook readings or lectures. This gives students an understanding of their role and the tasks for the project, prior to delivery of texts, lectures and other instructional methods. Early engagement gives students a readiness for learning.

4) Teachers as Co-Designers and Collaborators
Teachers collaborate as project and curriculum designers, working with a team to integrate AP content with a set of projects selected and adapted for their students. Reflective practice and collaborative development of projects and course design can lead to transformation of academic settings.