# Planning with the Six A's and Essential Questions

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25th July 2021

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This paper will discuss how the use of the Six A's of Integrated Curriculum and essential questions can be developed and incorporated in an integrated curriculum unit. The two disciplines to be integrated are Grade 9 or 10 mathematics and design technology, through the umbrella topic of algorithms. The focus problem (or in this case challenge) that students will address during the course of the unit is designing a smartphone app that allows users to quickly search a map of their city for nearby outlets of a brand, chain or public service of the students' choice. The application of each of the Six A's from the perspectives of teaching and learning and assessment will be considered and proposed essential questions for the unit will be developed based on the characteristics of effective essential questions suggested in the literature.

## Incorporating the Six A's

The Six A's of Project Design, also referred to as the Six A's of Instructional Design (Almeida & Steinberg, 2001), are a framework for helping high school teachers to integrate authentic, real-world learning experiences into classroom projects and units of study. First described by Steinberg in 1997, the brief definitions of each of the Six A's that follow have been adapted from a rubric for examining whether a project includes elements of all Six A's from Almeida and Steinberg (pp. 32-33). Once definitions have been established, suggestions for ways in which each "A" could be applied in the integrated curriculum unit described above will be discussed, from the perspectives of teaching and learning and assessment.

### Defining the Six A's

#### *Authenticity*

Projects should be meaningful to students, simulate real work tasks that they might perform in their future careers, and produce something of real value.

### *Academic Rigor*

In the process of completing projects, students should acquire age-appropriate disciplinary knowledge and skills from each discipline involved. Projects should be appropriately challenging and require students to use and develop higher-order thinking skills.

### *Applied Learning*

Disciplinary knowledge and skills are applied in contexts beyond the school walls, and in doing so students develop workplace skills such as teamwork, problem solving and self-management.

### *Active Exploration*

Students collect and process authentic primary and secondary data by interfacing with the outside world and present their findings to an audience other than their teacher.

### *Adult Connections*

Projects involve some form of mentoring of students by adult experts and said adult experts should collaborate with teachers in designing and assessing projects.

### *Assessment*

In addition to traditional forms of assessment based on teacher judgement, students should self-assess against self-developed project success criteria, and also receive feedback from adult experts. Assessment should be ongoing and performance-based and include a portfolio or exhibition component.

## Applying the Six A's

### *Authenticity*

**Teaching and Learning.** Lessons and interactions focusing on disciplinary skills and knowledge should be linked to the project context wherever possible. Students could be asked to document and share their work using the same software tools as those in the workplace.

**Assessment.** Students can choose to target their app towards a user group that frequents locations that are meaningful in their own lives. Perhaps they could even be supported with launching their app in real online app stores.

### *Academic Rigor*

**Teaching and Learning.** Lessons and project deliverables will be mapped to the appropriate discipline-specific KUDs (what students should know, understand and be able to do) and will also facilitate students in developing "new/evolved conceptual understandings as a result of purposeful integration of disciplinary knowledge or perspectives" (Erbes, 2020, What can teachers expect? section, para. 3).

**Assessment.** Larson (2019) suggests having adult experts check student content knowledge before allowing students to proceed with work beyond certain points, or better still, having students directly create the product for an industry client, as ways of achieving academic rigor in project-based learning (PBL). This is also a way of integrating adult connections.

### *Applied Learning*

**Teaching and Learning.** If lessons and interactions are frequently linked to the project context as described above, newly acquired disciplinary knowledge and skills can be applied in the new context as required. Students could complete all tasks in their project teams for the duration of the unit (see next point).

**Assessment.** Students could form project teams of 3-4 to allow the work to be divided according to each team members strengths (for example, coding, online marketing, graphical user interface design and developing algorithms from the mathematical methods studied). This would also then allow them to learn about project management techniques.

### *Active Exploration*

**Teaching and Learning.** To turn “traditional science labs” into authentic primary data, Larson suggests that project-based learning (PBL) practitioners can “apply the results of those experiments to the larger project context” (2019, Active Exploration section, para. 4). The same logic can be applied to spreadsheets, code, and graphs created as part of disciplinary lessons.

**Assessment.** While this particular project may not require a physical field trip, students will still need to collect and analyze authentic data such as search traffic, downloads and user surveys. As part of their performance-based assessment, students would need to create a “pitch deck” and present it to a panel of potential investors from the school community.

***Adult Connections***

**Teaching and Learning.** It is hoped that regular classroom visits by one or more industry experts to consult with student project teams can be arranged. At the very least, a guest speaker could attend the project launch, and the week-to-week project mentoring could be divided among the mathematics and design teaching team. An adult mentoring model can be an effective method of helping students to internalize new learning that is in their so-called “zone of proximal development” (Eun, 2019). For this to be effective, it will require close cooperation between mentors and each student’s disciplinary subject teacher, in order for the just the right amount of scaffolding to be provided to each student in each discipline.

**Assessment.** Community experts should be engaged well in advance of the project launch so that they can have input into the project scope and assessment criteria, and so as to maximize the chance of them being able to attend and give feedback on the final presentations.

***Assessment***

Several aspects of assessment have already been discussed above; however, a few more salient points will be mentioned here. A rubric would need to be developed or adapted to judge the quality of student-developed project success criteria and use of said criteria to self-assess. This is aligned with the "reflection and self-assessment" principle of integration. Apart from the products already mentioned, other possible forms of integrated communication that could be used as assessment for this unit include app support documentation and promotional material, and project management documentation such as a project journal and lessons learned file.

## Incorporating Essential Questions

There is much advice online and in the literature on how to write what might generally be referred to as "unit purpose-defining questions", variously referred to as "essential questions" (Bartis, 2015; Wilhelm, 2012), "framing questions" (Almeida & Steinberg, 2001) and "driving questions" (Miller, 2015; PBLWorks, 2019). Bartis (2015) suggests a list of seven characteristics, while Wilhelm (2012) and Almeida and Steinberg (2001) have distilled them into an essential three. From these lists, some common elements can be identified: they should be meaningful and relevant to students, invite ongoing inquiry, and require the acquisition of skills and knowledge that are applicable in the real-world in order to answer them. If being used in an integrated curriculum unit, they should also bridge the two disciplines or be applicable to both. Wilhelm provides some other useful entry points or lenses for thinking about unit essential questions, such as "why is (the topic) in the curriculum in the first place?", looking at where the topic intersects with the community, and turning the "big ideas" of the unit, concept or discipline into questions (p. 27). As Miller (2015) suggests, perhaps most important of all is that an essential question (or driving question, in a PBL context) should help with answering that age-old student question "why do we need to learn this?". Considering these factors, and using PBLWorks' Driving Question: Tubric 2.0 (2019) for scaffolding, the following essential questions are proposed for the integrated curriculum unit described above:

- How can we design a product for an online audience?
- How do brands decide on new store locations?
- Should organizations always use mathematics to make decisions?

As Almeida and Steinberg (2001) suggest, these questions could be used as a starting point for generating further inquiry questions in collaboration with students at the beginning of the unit, once they know enough about the nature of the topic and project. Once the list of essential questions is complete, they can then inform the generation of standards- or content-based inquiry questions for each lesson or interaction (Miller, 2015). Wilhelm summarizes how essential questions inform further unit and lesson planning nicely with this statement: "The phrasing of the essential question organically informs the kinds of learning activities and culminating projects students will undertake to answer it." (2012, p. 26). In other words, essential questions provide a lens for focusing all subsequent inquiry in the unit, as well as the glue that connects the unit teaching, learning and assessment.

## Integrating Ideas

Using an integrated approach, we can make some connections between several ideas discussed in this paper. Almeida and Steinberg (2001) summarized the utility of the Six A's as a "two-way" connection: if a unit or project is too academically focused, they can help to connect it with real-world concerns outside the classroom, and if a real-world concern is the inspiration for a classroom project but lacks connections to academic standards, the Six A's can help bridge the gap (p. 30). This is analogous to Hedegaard's concepts of understood knowledge and active knowledge (as cited in Eun, 2019). The former is acquired through formal instruction, while the latter is acquired through interacting with the world. In this way, the Six A's can be thought of as a framework for integrating understood knowledge with active knowledge. Well written essential questions should also function in a similar two-way fashion: if the inquiry begins with a real-world situation, it will lead to new academic knowledge, and if the inquiry begins with an academic concept, the inquiry will lead to real-world connections. Thus, the use of the Six A's and essential questions is highly appropriate for 21st century learners, because they help students to integrate academic knowledge with 21st century skills.

## Conclusion

The use of the Six A's and essential questions can strengthen the real-world connections already present in an integrated mathematics and design technology unit and provide a lens through which to focus inquiry and integrated disciplinary skills and knowledge. To summarize the value of this approach to planning an integrated unit, PBLWorks' Project Design Rubric (2019) can serve as a framework for evaluating the unit and project. The proposed integrated curriculum unit includes (or at least has the potential to include) all features of effective PBL listed in the right-hand column, and thus the Six A's and essential questions can be considered highly effective in the design of such units.

## References

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