Multimedia Project Critique 2

Khan Academy AP Statistics Critique

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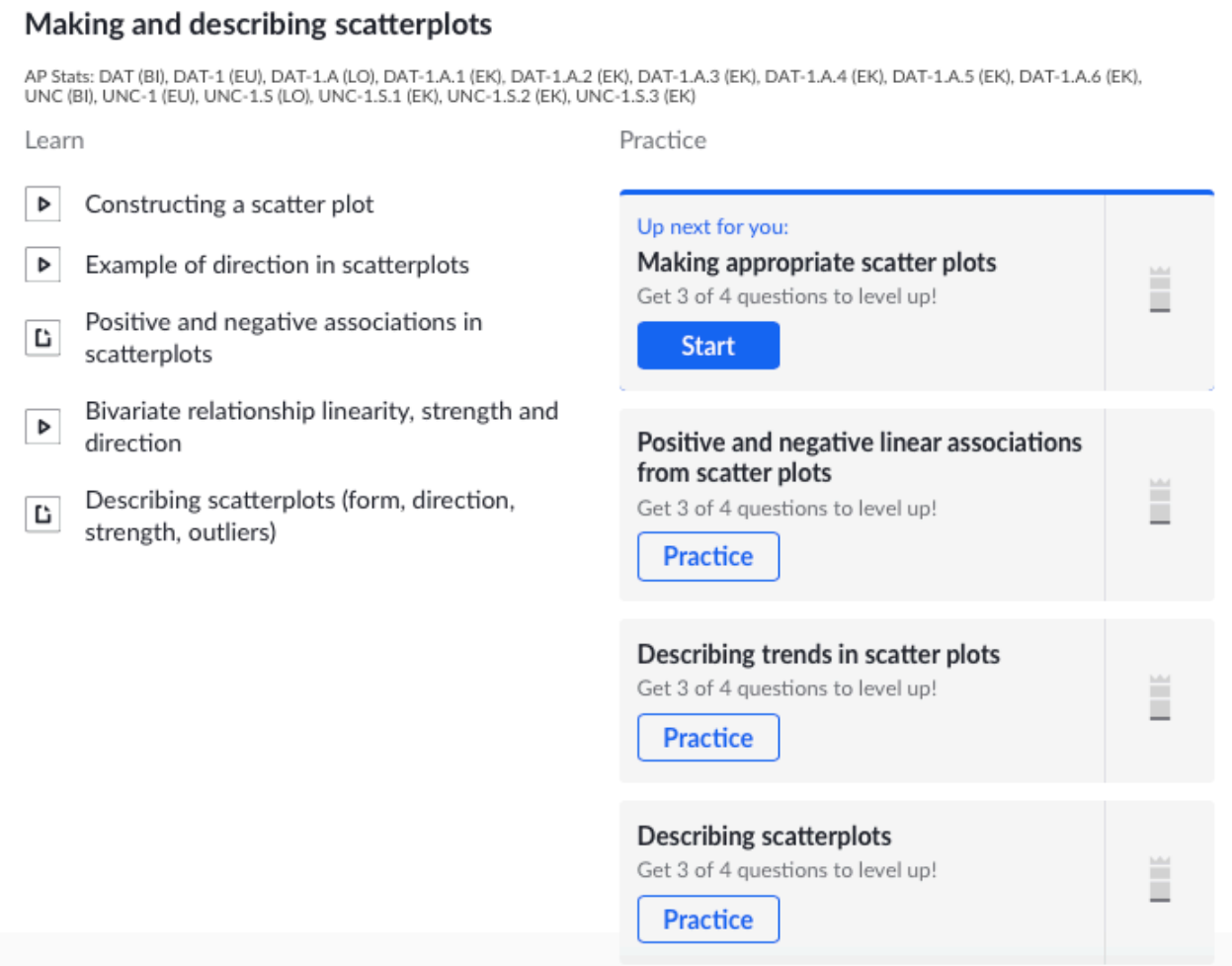
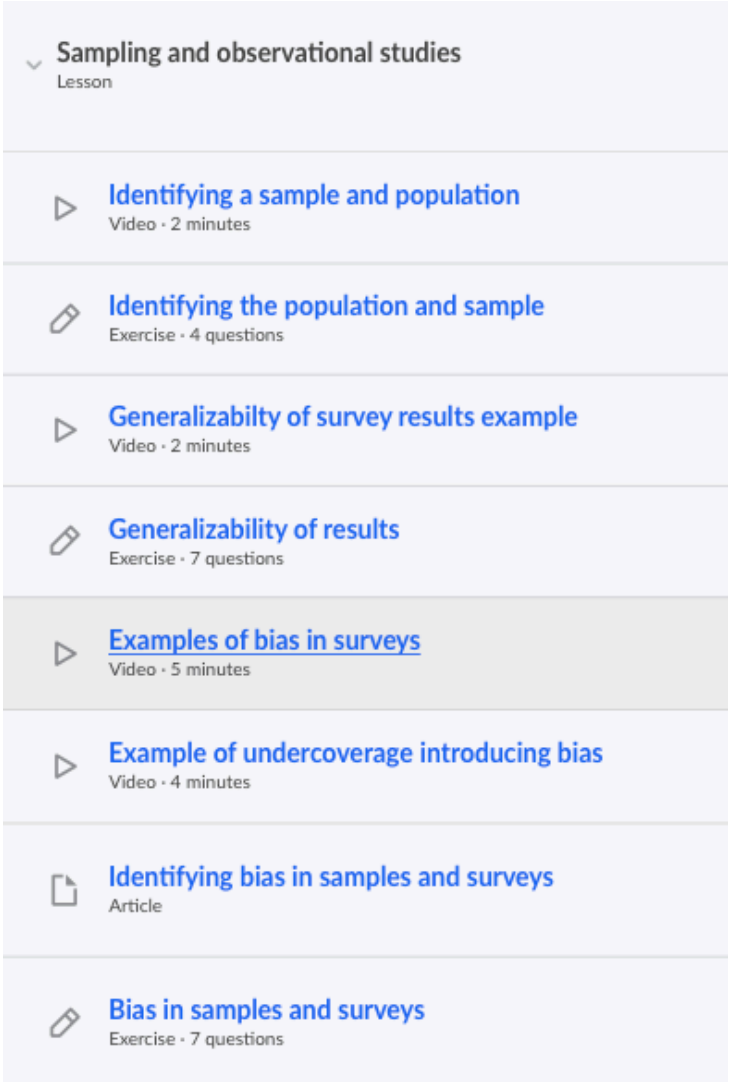
Since it was founded in 2008, Khan Academy has provided free learning resources to millions of educators around the world. Originally focused on math, Khan Academy now hosts several courses spanning all math levels (preschool through college), social studies, science, SAT prep, and English Language Arts (currently in beta mode at the time of this paper) – and it is still expanding its repertoire of courses. Khan Academy focuses on the use of video tutorials and practice with immediate feedback to help learners progress through the standards. In recent years, features such as "Mastery Courses" have allowed teachers to personalize the content and allow for differentiation based on student performance. While it would be impossible to review Khan Academy in its entirety, the focus of this paper is on one course, AP Statistics. As an advanced placement (AP) course, College Board has very specific standards and test formats, so this paper will delve into the ways Khan Academy's AP Statistics course adheres (or fails to adhere) to multimedia principles as it supports its learners.

Upon logging into Khan Academy's AP Statistics course, it is clearly organized into 14 instructional units, all of which mirror the content of the 9 units promulgated by College Board. Students can select a unit, and they will see a clear progression of videos, practices, quizzes, and a culminating unit test. Each topic lists its associated AP standards first, and then lists the learning activities in order where videos and practices are denoted by different icons. Additionally, the students will see a list of practice to complete. As students complete the practice, their points accrue in Mastery Course so they can "level up" their points and standing. See image below for an example of these features:



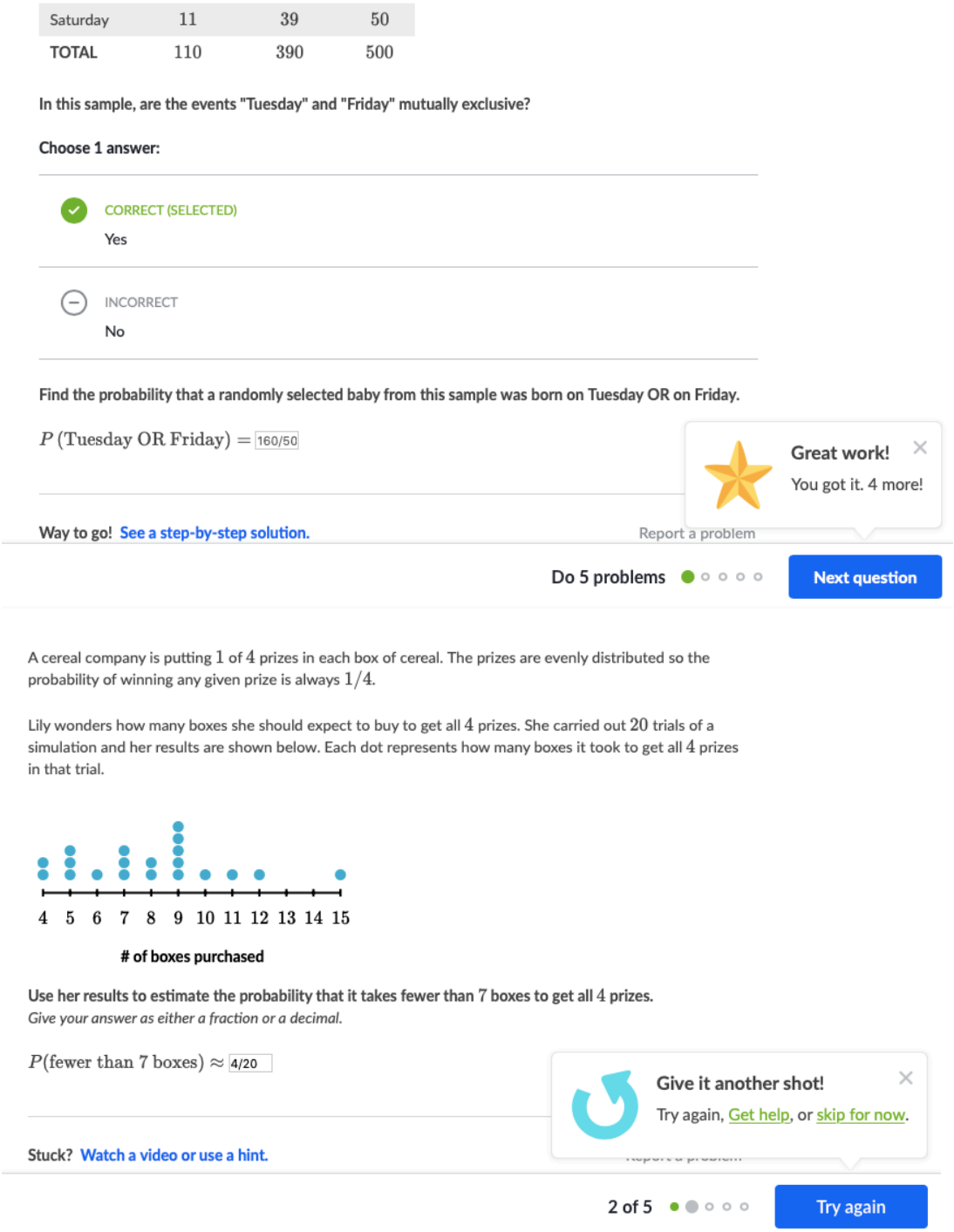
As students complete the practice, they receive immediate feedback on their answers. Even if answered correctly, students can choose to see a step-by-step explanation. If incorrect, students can choose to “try again”, “get help” (links to a video), or “skip for now”. They can also opt to receive a “hint”, which provides a similar type worked example. Once students have proceeded through all the instruction, the unit ends with a culminating test. This test is generally a combination of both multiple choice and short answer problems where students must calculate and manually type in their answers.

Upon first viewing, Khan Academy adheres to several multimedia design principles. The first that is clearly evident is the use of the segmenting principle. Mayer & Pilegard (2014) define segmenting as the idea "people learn more deeply when a multimedia message is presented in learner-paced segments rather than as a continuous unit" (p. 316). In the figure below, an example is provided that shows an overview of a lesson from the AP Statistics course. Learners can clearly follow the progression of steps, and with the details included about time of videos and number of questions in practice, they can make informed decisions to control how much they wish to complete in one sitting.



In all Khan Academy courses, videos play an integral part as they are the means for conveying the content. Because of the heavy reliance on videos, the modality principle is also clearly on display in the AP Statistics course. In the modality principle, according to Low & Sweller (2014), "students learn better when the associated statements are narrated rather than presented visually" (p. 227). The AP Statistics course videos all contain auditory narration while on screen animation (usually in the form of problem solving) is occurring. An issue of note is that closed captioning of the videos (which provides on screen text of the audio comments) is automatically turned on, which can increase cognitive load and potentially lead to extraneous overload as both sources of information (on screen animation and on screen text) are processed by the visual system (Low & Sweller, 2014, p. 235). However, it is easy to click off the closed captioning to remove the text on screen and just have the auditory narration.

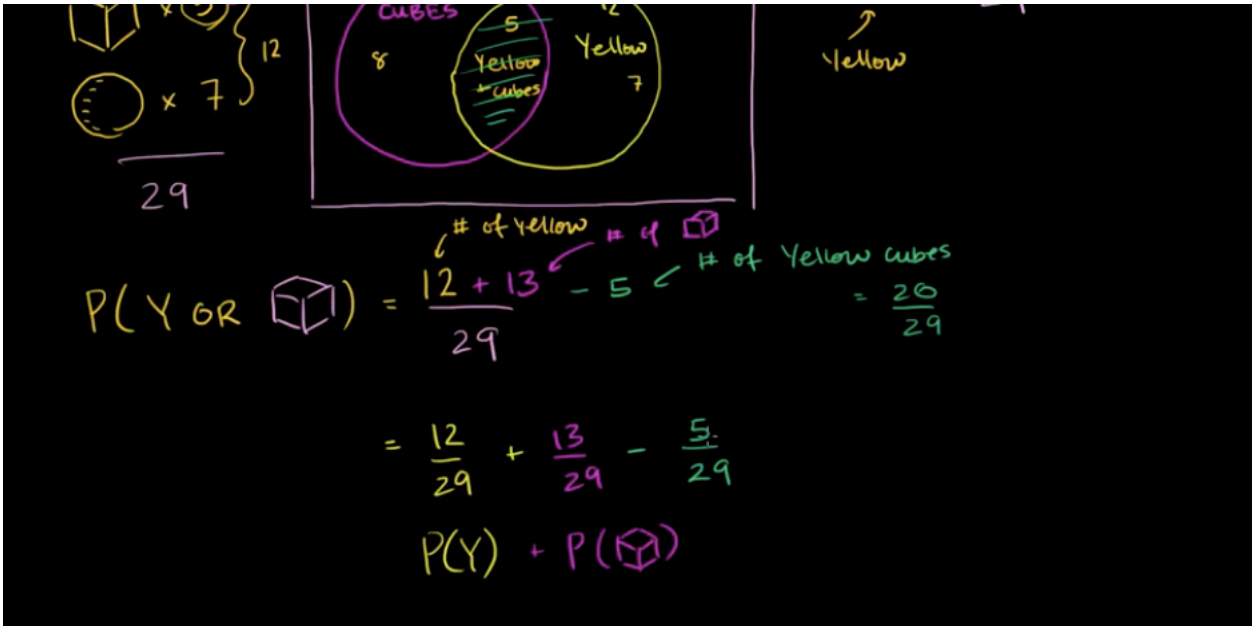
Along with segmenting and modality principles, Khan Academy's AP Statistics course incorporates the feedback principle particularly well. As seen in the figures below, the AP Statistics course provides different types of explanatory feedback regardless of whether the original answer was correct or incorrect:



In the images above, correct answers link to a “step by step solution” and incorrect answers are offered “get help”, “watch a video”, or “use a hint”. According to Johnson & Priest (2014), “explanatory feedback guides the learner in selecting the appropriate information and consequently reduces the amount of extraneous processing relative to providing only corrective

feedback" (p. 449). By providing explanatory feedback and not just corrective feedback, the extraneous cognitive load is lessened because the student does not have to expend memory capacity determining why an answer was incorrect (Johnson & Priest, 2014, p. 451).

Perhaps the most prominent multimedia design principle on display in Khan Academy's AP Statistics course is the worked examples principle. Worked examples are, in essence, a problem with its solutions steps that led to the final answer (Renkl, 2014, p. 392). The following screenshot shows an example of a worked example from Khan Academy's AP Statistics course:



This type of video, followed by its associated practice problems, follows Renkl's (2014) typical procedure for worked examples: introducing the principle, followed by multiple worked examples (one is not enough), followed by student's individual work on problems (p. 392). Renkl states "when beginning learners solve problems, the corresponding demands may burden working memory capacities or even overload them" (p. 400). Thus, especially during initial knowledge acquisition, worked examples such as those provided by Khan Academy's AP Statistics course help the learner attain new knowledge while taking care to minimize any potential extraneous overload.

While Khan Academy's AP Statistics course clearly adheres to several multimedia principles as evidence above, it is severely lacking in one area. The AP Statistics Exam, which provides students with college level credit if they pass, is designed as a half multiple choice, half free response exam. While Khan Academy does an adequate job preparing students for the multiple choice section, it does little to prepare students for the free response portion. The free response questions demand high level conceptual understanding, interpretations, and clear communication of patterns and connections between topics. This could best be accomplished if Khan Academy incorporated the self-explanation principle into its multimedia design. Wylie & Chi (2014) define the self-explanation principle as "a constructive or generative learning activity that facilitates deep and robust learning by encouraging students to make inferences using learning material, identify previously help misconceptions, and repair mental models" (p. 413). Even without an expert present, encouraging students to self-explain by engaging cognitively with the material led to improved learning outcomes (Wylie & Chi, 2014, p. 415). Khan Academy would no doubt have difficulty incorporating this principle, as it would be near impossible to program an algorithm for providing instant feedback to such activities. However, a possibility could be providing students with a self-explanatory task, similar to an AP exam free response question, and then providing a video explanation that students can view after trying to task on their own. While not a perfect system, it would at least provide opportunities for learners to make connections and practice higher level thinking as they refine their schema domains in preparation for the AP exam. As it currently stands, the AP Statistics course is more than adequate for offering basic conceptual and procedural support to students, but it lacks true depth in terms of cross-conceptual application type problem solving skills.

Ultimately, the AP Statistics course in Khan Academy provides a valuable free resource for educators interesting in supporting their in-class instruction with a well-designed multimedia product. While it is still lacking in truly rigorous, schema refining cross-conceptual tasks that will assist in increased performance on the free response portion of the AP exam, it provides thorough instruction in the basic conceptual knowledge and procedural skills needed as the foundation for success. Caution is advised if an instructor wished to use Khan Academy AP Statistics as their sole means of instruction, but as part of a well-rounded instructional design the AP Statistics course is a highly recommended supplemental resource.

References

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