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Exploring Pop-Up Books 80 min

Objective:

Students will use the engineering process to develop pop-up mechanisms of their own design.

Big Idea:

Engineers create new things from the inspiration of the work of others.

Engineers often create many failed models before developing successful ones.

1. Warm Up / Anticipatory 10 min

Ask students to share their definitions of a "book" and then ask for a definition of a "pop-up" book. What makes a pop-up book unique and special within the larger category of books? Follow up by asking if anyone has specific experience with pop-up books. Does anyone know of any pop-up book authors? Do you think that pop-up books are a recent invention? Has anyone ever attempted to make a pop-up book? What other things do you wonder about pop-up books?

Resources

- Official Website of Robert Sabuda http://wp.robertsabuda.com/make-your-own-pop-ups/
- http://wg.wonderopolis.org/uploads/users/72/219/IMG_1839.jpg

2. Investigation and New Learning 60 min

Ask students to whisper read Wonder of the Day #1146: How are Pop-Up Books Made? with a partner. They should stop after each paragraph and have a collaborative conversation about what was just read: What was the central idea of the paragraph? What was a particularly interesting details? What questions do you have?

After reading the entire article, ask students to write down two things that they learned about pop-up books that they wish to share with the group. Pull the whole class back together and share these notable ideas.

Use the "Up for a Challenge?" link at the bottom of the Wonder of the Day page to view the How to Make a Pop-up Layer and How to Make a V-Fold Mouth Pop-up directions from Robertsabuda.com.

Ask students to **imagine and plan** their own pop-up creations. Distribute paper and scissors to the reading partner groups and ask them to create these two pop-up mechanisms. Once they have mastered these, as them to experiment and develop their own unique designs. It may take several failures in order to learn about how pop-ups work before anything great is created, so be sure to encourage and support your students in their discovery.

Periodically call students attention to someone who **create**s a successful pop-up mechanism. Ask them to share their success with the class. It is equally helpful to the class for them to share their failures too, so be sure to ask for those to be shared as well. The class can then offer ideas to help them **improve.**

3. Review & Check for Understanding 30 min

In a whole group discussion review the engineering design process (ask, imagine, plan, create and improve) by having students share ideas about pop-up for each element. They should use both the information from the Wonder of the Day and from their own discoveries. Highlight or ask for specific examples of how their designs were inspired by the work of others. Highlight or ask for specific examples of how failed attempts led to success.

Standards: K.S.1A.1. K.S.1A.3. K.S.1A.4. K.C.MC.2.1. K.RI.LCS.11.2. K.RI.P.4.3. K.RI.MC.6.1. K.S.1A.5. K.S.1A.6. LA 0.4.1.A. LA 0.4.2.B. 2.1.1.B. LA 0.1.6.O. LA 0.1.6.N. K.S.1A.8. RI.K.1 K.RI.P.4.1. K.RL.MC.6.1. K.I.4.3. K.I.5.2. 5.1. K.I.4.1. K.I.3.2. K.W.5.1A. K.SL.3.1. 3.2. 3.1. K.RL.P.4.1. 0.1.5.5. 2.1. 4.1. 2.1. 1.1. 2.1.1.D. 2.1.1.E. SG3. 0.10.6.6. 0.8.2.2. SG2. SG1. SE1. SE2. 0.6.8.8. 0.6.1.1. 0.2.2.2. 0.2.1.1. 0.1.7.7. 0.2.4.4. 0.2.8.8. 0.3.0.4. 0.2.10.10. SA1. [3] SC4.1. RI.K.2. RI.K.4. RI.K.8. RI.K.1. RL.K.7. 2.1.1.F. RL.K.5. RI.K.10. RF.K.4. [3] SA1.2. [3] SA2.1. [3] SA1.1. L.K.6. W.K.8. SL.K.2. K.RV.3.2. K.RL.P.4.3. K.10 (A) K.20 (A) (K.9) K.4 (B) K.9.C) K.5.C) 110.11 (B) 110.11 (C) K.3 (C) LA 0.1.5.B. K.RV.1.1. K.2 (B) 110.11 (F) K.1.A) K.1.B) RI.K.10 RF.K.4 RI.K.8 RI.K.4 RI.K.2 W.K.1 W.K.8 K.1.X) K.1.H) K.1.K) L.K.6 SL.K.2 LA 0.1.5.C. K.2 (D) K-2-ETS1-1. K.RF.1.1. LA 0.1.6.D. K.RL.3.1. K.RN.2.2. K.RN.1.1. K.RN.2.1. K.I.3.1. LA 0.1.6.M. K.RL.4.1. K.RN.4.1. LA 0.1.6.E. LA 0.1.6.F. LA 0.1.6.I. K.RN.3.2. LA 1.4.2.B. LA 1.4.1.A. 2.1.1.B. LA 1.2.1.C. LA 1.1.5.C. 1.1.B) 1.10.G) 1.10.F) LA 1.1.6.D. LA 1.1.6.E. LA 1.1.6.O. LA 1.1.6.N. LA 1.1.6.I. 2.1.1.D. 1.1.1.1.2. 1.1.I) 1.1.X) 1.1.7.7. 1.2.1.1. 1.2.2.2. 1.RN.2.1. 1.RN.1.1. 1.RF.2.1. 1.RF.1.1. 1.RF.2.2. 1.RL.3.1. 1.RL.4.1. 1.2.4.4. 1.2.6.6. 1.8.7.7.B. 1.8.7.7.A. 1.10.4.4.A. 1.8.E) 2.1.1.F. 1.8.2.2. 1.6.8.8. 1.2.7.7. 1.2.8.8. 1.2.10.10. 1.3.0.4.A. 2.1.1.E. 1.RN.4.1. 1.RL.MC.6.1. 1.I.4.1. 1.I.3.2. 1.I.3.1. 1.RL.LCS.9.2. 1.RI.MC.6.1. 1.RI.LCS.11.2. 1.RI.LCS.9.1. 1.RI.LCS.8.1. 1.I.2.1. 1.18 (A) 110.12 (D) 110.12 (F) 1.2 (B) 1.2 (D) 110.12 (C) (1.26) 1.19 (C) 1.24 (A) (1.25) 1.W.MCC.2.1. 1.S.1A.1. 1.RV.1.1. 1.RV.2.1. 1.RV.3.2. 1.SL.3.1. 1.RN.2.2. 1.1.A) 1.8.C) 1.8.B) 1.7.B) LA 1.1.5.B. 1.4 (B) 1.S.1A.5. 1.S.1A.4. 1.S.1A.3. 1.S.1A.6. 1.S.1A.8. 1.6 (C) 1.14 (A) 1.14 (B) 1.8.D) LA 1.1.6.M. RI.1.1. RI.1.2. RI.1.4. RL.1.7. RL.1.5. RI.1.2 RI.1.1 RI.1.6. RI.1.7. SL.1.2. L.1.4.A. W.1.8. RF.1.4.C. RI.1.10. RF.1.4.A. RI.1.6 RI.1.7 1.1. 4.1. 3.1. 3.3. K-2-ETS1-1. 1-PS4-4. 2.1. L.1.4A RI.1.10 RI.1.8 RF.1.4A RF.1.4C SL.1.2 W.1.8 [3] SA1.1. RI.1.4 SA1. [3] SC4.1. SE1. SE2. SG3. SG2. [3] SA2.1. SG1. [3] SA1.2. 10.8.D) 110.47.8 (B) 10.6.B) 10.5.G) 10.4.G) 10.5.F) 10.5.H) 110.47.8 (A) EIII.15 (C) (V) EIII.9 (B) EIII.21 (B) EIII.23 (E) 110.33 (B) 110.33 (A) 10.3.F) EIV.1 (B) (EIV.8) 110.34 (B) EIV.9 (D) EIV.15 (C) (V) EIV.23 (E) EIV.21 (B) 110.46.1 (A) 110.46.2 (D) EIV.2 (C) 110.34 (A) 110.47.3 (D) 110.47.2 (A) 110.47.1 (A) EIII.2 (C) EIV.1 (A) EII.23 (B) SG3. SG2. SG1. RST.9-10.4. RST.9-10.5. WHST.9-10.4. WHST.9-10.2.D. SE2. SE1. [10] SA1.1. L.9-10.6. [10] SA1.2. [10] SE1.1. SA1. [10] SE3.1. E3.RI.MC.6.1. E3.RI.LCS.8.1. EII.22 (B) EII.21 (B) 110.47.4 (C) 110.32 (A) EIII.1 (A) 110.32 (B) EII.9 (B) (EII.8) E3.RI.LCS.9.2. E3.RI.LCS.9.1. E3.RI.LCS.9.3. 110.31 (B) EII.2 (A) EII.1 (A) EIII.1 (B) 110.47.5 (B) 110.54.5 (A) 110.54.5 (B) 110.55.1 (A) 110.54.3 (A) 9.5.4.4. 9.7.8.8. 9.7.7.7. 110.55.2 (A) 110.55.2 (B) 110.55.3 (C) 110.55.4 (A) 110.55.3 (B) 110.55.3 (A) 110.55.2 (C) 110.55.2 (D) 9.9.7.7.B. 110.53.3 (B) 9.1.1.1.7. 9.13.4.4. 9.1.1.1.6. 9.1.1.1.2. 9.11.4.4.D. 9.11.6.6. 9.13.5.5. 9.14.2.2.D. 110.51.2 (L) 9.11.4.4.A. 110.51.2 (C) 110.49.2 (B) 9.14.4.4. 110.48.6 (C) 110.55.4 (B) 110.55.4 (C) E4.I.2.1. E4.I.1.1. 110.48.3 (A) 110.48.4 (E) 110.48.5 (A) 110.48.4 (F) E3.C.MC.1.1. E3.RI.LCS.11.2. 110.48.1 (A) 110.47.9 (E) 110.48.2 (A) 110.48.2 (F) E3.RI.LCS.9.5. E3.RI.LCS.9.4. 110.48.6 (A) 9.4.7.7. 110.59.1 (C) 110.63.1 (E) 110.59.1 (A) 110.55.5 (B) 110.55.4 (D) 110.55.5 (A) 110.47.6 (C) 110.47.6 (A) 9.4.10.10.A. 9.4.10.10.B. 9.4.10.10.B. L.9-10.4.D. 9.5.2.2. 9.5.1.1. 110.47.8 (D) E3.I.3.2. E4.RI.LCS.9.2. E4.RI.LCS.9.3. E4.RI.LCS.9.4. E4.RI.LCS.9.1. L.9-10.6 L.9-10.4A L.9-10.4D E4.RI.LCS.9.5. E4.RI.LCS.11.2. RST.9-10.5. WHST.9-10.2(D) RST.9-10.4. H.P.1A.8. E4.C.MC.1.1. H.P.1A.6. W.9-10.8 W.9-10.7 E4.I.5.2. E4.RI.P.4.1. L.9-10.4.A. E4.I.4.1. E1.I.1.1. E4.I.3.4. E4.RI.P.4.3. E4.RI.MC.5.1. RI.9-10.2 RI.9-10.4 RI.9-10.1 E4.RI.LCS.8.1.