CREATIVE TECHNOLOGY RESEARCH LAB | COLLEGE OF EDUCATION UNIVERSITY OF FLORIDA

Project TACTIC: Teaching All Computational Thinking through Inclusion and Collaboration

TACTICal Teaching Brief

Helpful Strategies for **Scaffolded Project Planning** during K-12 Computer Science Instruction

Introduction

Purposeful project planning is a critical component of effective computer science (CS) education. Without guiding students towards a clearly-articulated end goal, many students with and without disabilities will encounter frustration and lack of success. Teachers can facilitate project planning by providing clear expectations, rubrics, and planning documents to support students' work, even when offering open-ended activities and with personally-meaningfully choice (e.g., develop their own stories within Scratch). Thus, rather than offering alternative activities, project planning can provide the supports and scaffolds. In this way, students who struggle can be successful without the need for lowering expectations. In fact, with the appropriate supports (e.g., project planning), open-ended activities like project based learning (PBL) can lead to positive outcomes for students with disabilities such as social acceptance, increased academic performance, peer interactions, active engagement in the learning process, and high self-efficacy (Fillippatou & Kaldi, 2010).

Scenario

Mr. Gibson is a 3rd grade teacher who has integrated CS education into his classroom core curriculum. Three students with disabilities are included in his 3rd grade class. Ms. Robbins, a paraeducator, provides support for these students during these CS education lessons.

1. Rachel has a learning disability related to math;
2. Roberto has a social communication disorder that kept him from verbally expressing his needs; and
3. Connie has an emotional behavior disorder as well as a speech/language impairment and often does not interact with her peers.

Mr. Gibson noticed that each of these students experience different challenges during computing and he realized that the students needed guidance and support in planning their CS projects. He noticed that some of the students without disabilities also struggled with the project planning.

1. **Rachel** has significant challenges with understanding complex sequences of steps, and becomes frustrated when she does not know what to do next.
2. **Roberto** is enthusiastic about his CS project work but gets bogged down periodically and has trouble productively expressing his needs as he attempts to carry out his project plan.
3. **Connie** has strong CS skills due to a personal interest in computing and video games. However, because she does not often take the time to read the directions and rubrics, she has difficulty with successful project completion.

Mr. Gibson meet with Ms. Gomez, the special education teacher, as well as Ms. Hightower, the speech/language pathologist to help address the challenges described above. With the support of these professionals, Mr. Gibson hopes to capitalize on the strengths of his students to help them develop project planning more effectively during the CS education activities.

Do any of these challenges sound familiar?
Can you relate to any of these?

Common Challenges

- Students often struggle with strategically planning out a CS project from beginning to end.
- Students may have difficulty generalizing from a teacher example or demonstration to their own work. They think that there is only one way of solving the problem--the way that the teacher modeled.
- Students often lose interest in computing when frustrated due to difficulty of the coding task or lack of background understanding when the CS activity is integrated into content instruction (e.g., math or science).
- Students who have difficulty reading struggle with written directions. Some students with reading disabilities, for example, may not understand directions embedded in CS activities, while others may not take time to read those directions.
    a. Students ignore clues that explain what they need to do (or what they did wrong).
    b. Students missed and/or not understanding a step in order to proceed to the next activity/project.

Strategies for Project Planning

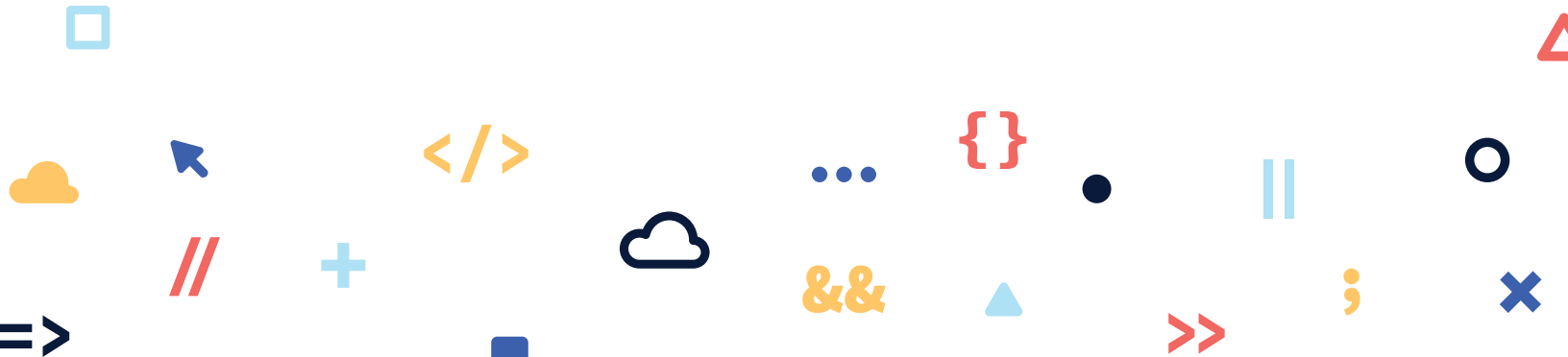
1. Create project-planning guides with limited use of text-based directions to break down CS projects so students can understand project expectations, options, and steps required to meet those expectations.
    - Project plans can offer options for:
        - Personally and culturally meaningful connections (e.g., animating a personal story).
        - Multiple options for demonstrating understanding (e.g., projects with different levels of complexity).

2. Create adapted version of the project planning guides for students who struggle.
    - For example, project guides can have more or less explicit directions built into them. They can also use more visuals and step-by-step supports.
    - Consider establishing objectives for all students and then adding project extras or additional challenges that may be attempted to extend learning.
    - It might be helpful to fill out these project planning guides together and pre-plan with the student to determine individual goals.

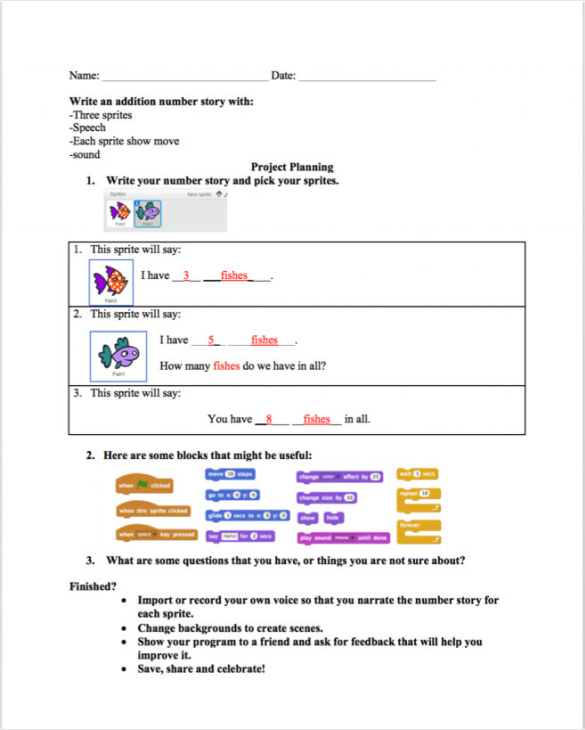
3. Model the project based learning process, including the use of project planning guides.
    - Front load new concepts, vocabulary, and procedures to proactively avoid challenges associated with new information.

4. Plan for periodic opportunities for reflection and goal settings.
    - This “check in” process can help students set project milestones. It also provides formative feedback to teachers, which can be used to ascertain student needs.

5. Remind students to use the project planning guides to problem solving and communicate their needs.
    - It is not enough to simply model and give these planning documents to students. It is important to encourage and provide ongoing feedback to students on their use of these tools.



Project Planning



Name: _____ Date: _____

Write an addition number story with:
-Three sprites
-Speech
-Each sprite show move
-sound

Project Planning

1. **Write your number story and pick your sprites.**

1. This sprite will say: I have __3__ __fishes__.
2. This sprite will say: I have __5__ __fishes__. How many fishes do we have in all?
3. This sprite will say: You have __8__ __fishes__ in all.

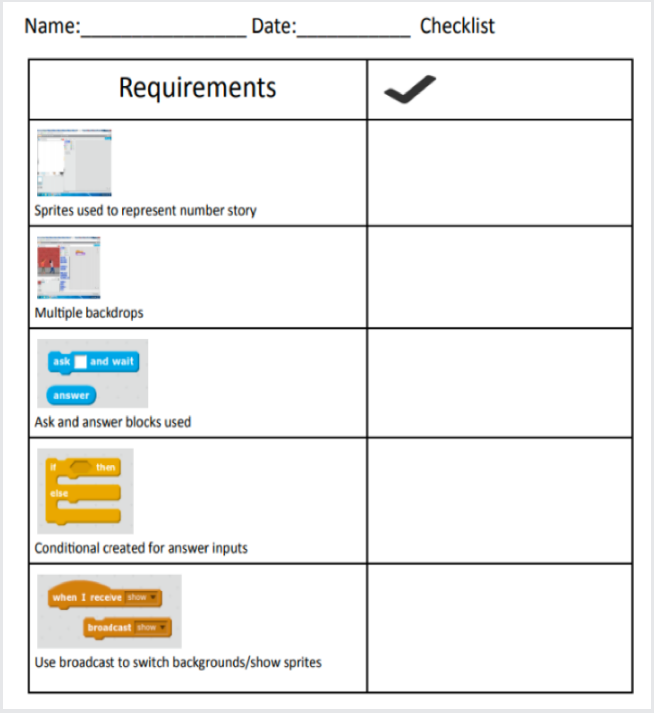
2. **Here are some blocks that might be useful:**

3. **What are some questions that you have, or things you are not sure about?**

Finished?

- **Import or record your own voice so that you narrate the number story for each sprite.**
- **Change backgrounds to create scenes.**
- **Show your program to a friend and ask for feedback that will help you improve it.**
- **Save, share and celebrate!**

Figure 1. Example of project planning (Developed by Kenwood Teachers at Champaign Unit 4 School District).



Name:_____ Date:_____ Checklist

Requirements	✔
Sprites used to represent number story	
Multiple backdrops	
ask and wait / answer Ask and answer blocks used	
if then / else Conditional created for answer inputs	
when I receive / broadcast Use broadcast to switch backgrounds/show sprites	

Figure 2. Example checklist to guide CS projects and ensure projects align with project rubric (Developed by Kenwood Teachers at Champaign Unit 4 School District).

Summary

Ms. Robbins is starting to feel like she is learning the CS curriculum and beginning to understand how to support Rachel, Connie, and Roberto more effectively. She also spoke with the special education teacher about the benefits of including Rachel throughout the entire CS lesson, but this scheduling issue was not fully resolved. With that said, Ms. Robbins is beginning to notice that with modeling and encouraging collaboration, these three students were experiencing more success during CS instruction and that they are more fully invested in the class activities. Ms. Robbins is starting to feel like she is learning the CS curriculum and beginning to understand how to support Rachel, Connie, and Roberto more effectively. She also spoke with the special education teacher about the benefits of including Rachel throughout the entire CS lesson, but this scheduling issue was not fully resolved. With that said, Ms. Robbins is beginning to notice that with modeling and encouraging collaboration, these three students were experiencing more success during CS instruction and that they are more fully invested in the class activities. Ms. Robbins is beginning to notice that with modeling and encouraging collaboration, these three students were experiencing more success during CS instruction and that they are more fully invested in the class activities.

Citations

Israel, M., Wherfel, Q., Pearson, J., Shehab, S., & Tapia, T. (2015). Empowering K-12 students with disabilities to learn computational thinking and computer programming. TEACHING Exceptional Children, 48(1), 45-53.

Park, M., & Lash, T. (2014). The Collaborative Discussion Framework. Champaign Unit 4v School District.

Funding for this research was provided by the National Science Foundation (award #1639837). Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect those of the NSF.

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