Scaffolding Students to Develop Project Ideas in a Project-Based Learning Environment

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Problem and Purpose

Generating project ideas can be a difficult task for students. Research showed that project-based learning requires much more time to compete, comparing to non-project based learning, because projects are usually complex in nature and situated in real life (Heckendorn, 2002). In particular, one of the most significant problems faced by students is the difficulty in generating ideas, especially when the ideas are used to produce concrete or abstract products (Heong, Yunos, Othman, Hassan, Kiong, & Mohamad, 2012). Therefore, instructors may face many more obstacles when trying to help students come up with a project idea. The purpose of this study is to identify different activities and methods that instructors use to facilitate the development of project ideas in a project-based learning internship environment.

Research Context

Work With A Scientist Program
- 4 scientists and their laboratory teams / year
- 36 high school students /year
- 7 months internship, including 10 Saturdays from January-May and 30 week days in June and July.
- Open-inquiry projects
- Proposal presentations to the public
- Final presentations to the public

Data sources
- 8 different laboratory teams from 2 years
- 384 hours of video recordings (the first 10 weeks of the internship, before the students presented their project proposals)
- Field Notes, Pictures, Artifacts

Theoretic Framework: Self-Directed Learning Model (SDL)

The Self-Directed Learning Model describes the different types of interactions that can occur between student and instructor. Manning (2007) defines four different stages and the role of both instructor and student in each stage. This theory serves as framework for our own definitions and classifications of student-instructor interactions.
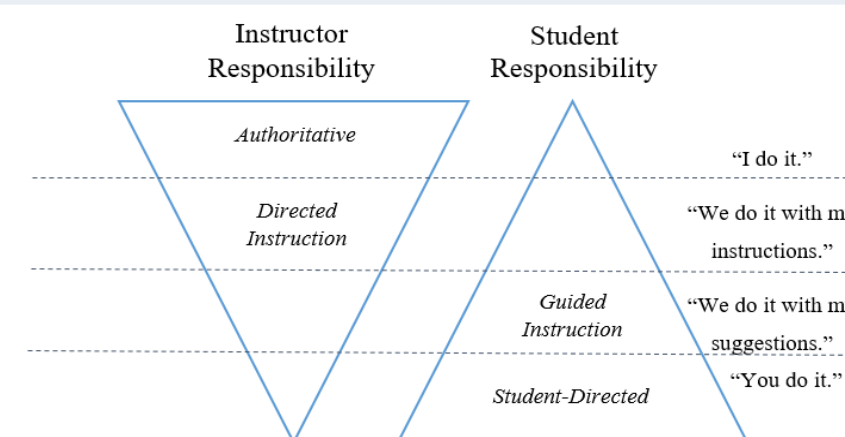
Stage	Student	Teacher	Examples
Stage 1	Dependent	Authority, Coach	Coaching with immediate feedback. Drill. Informational lecture. Overcoming deficiencies and resistance.
Stage 2	Interested	Motivator. Guide	Inspiring lecture plus guided discussion. Goal-setting and learning strategies.
Stage 3	Involved	Facilitator	Discussion facilitated by teacher who participates as equal. Seminar. Group projects.
Stage 4	Self-Directed	Consultant, Delegator	Internship, dissertation, individual work or self-directed study group.

Results

To understand how students generated their project ideas, we used the Self-Directed Learning Model to classify the activities and interactions. As a result, 4 different classifications were identified: Authoritative, Instructor-Directed, Instructor-Guided, and Student-Directed Activities. These classifications are described in detail below.

Category	Definition	Examples
Authoritative	The instructor has a predetermined project idea in mind, and students have minimal autonomy in this project choice.	➢ **Authoritative Lecture-** The instructor has predetermined lesson plan and presentation, student engagement is minimal, and questions are left until the end of the lecture. ➢ **Demonstrative Hands on Practice-** The instructors perform the lab tasks while students watch and take notes.
Instructor-Directed	The instructor has a predetermined topic they would like to use for the project ideas, but refines specific methods to accommodate to the students interests.	➢ **Interactive Lecture-** The instructor provides a presentation that includes activities and questions that keep the student constantly engaged. Small discussion about the material are encouraged within the lecture. ➢ **Instructor-Directed Hands on Practice-** The instructor provides the directions and steps to the lab task and makes sure students perform it correctly.
Instructor - Guided	The instructor and student work together and collaborate to create an idea that fits the instructors scope of practice as well as the student's interests.	➢ **Instructor-Guided Reading and Presentations-** The instructor assigns readings and presentations on a topic that they are familiar with. ➢ **Instructor-Guided Discussion-** The instructor has a predetermined purpose of the discussion and leads the discussion. ➢ **Instructor-Guided Hands on Practice-** The instructor provides lab tasks, but students may have to do further research.
Student-Directed	The instructor gives full autonomy to the student when choosing their project idea and provides minimal revision.	➢ **Student-Directed Reading and Presentations-** The instructor assigns readings and presentations, but asks the students to present new ideas/information based on their own interests. ➢ **Student-Directed Discussion-** The students lead the discussion and pick the topic that they would like to talk about (pertaining to the internship). ➢ **Student-Directed Hands on Practice-** The students research and discuss with instructors what they would like to do in the lab.

Model of Instructor and Student Responsibility- The model shows how instructor responsibility decrease as the activities become more student directed and that student responsibility decreases as instructors gain more authority.

Instructor Responsibility / Student Responsibility

Authoritative	"I do it."
Directed Instruction	"We do it with my instructions."
Guided Instruction	"We do it with my suggestions."
Student-Directed	"You do it."

AVERAGE TIME PERCENTAGE
Average percentage of weekly time spent in the 4 different types of interactions from 8 labs

Conclusion

1. Based on the Overall Averages the interaction that was observed the most was the Instructor-Directed interaction and the interaction observed the least was the Student-Directed interaction.
2. The lab groups usually started off with Authoritative and Instructor-Directed activities before moving on to Instructor-Guided and Student-Directed activities.
3. From the Weekly averages we can see that student-directed activities did not appear until Week 8.
4. Based on the data from the Weekly Averages, Authoritative and Instructor-Directed activities were used throughout the 11 week period.

Overall Average
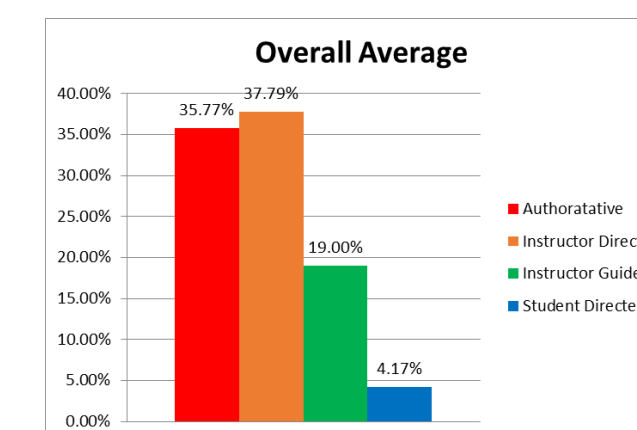
Discussion

1. It seems that most instructors acted in an authority role or instructor-directed role at the beginning of the internship and as students approached the project proposal deadline they had more autonomy in their internship activities. This pattern can be connected to the fact that:
   a) instructors needed more authority at first to communicate and teach the different topics of science inquiry to students that lacked knowledge about PBL.
   b) As students become more familiar with the topics some instructors were willing to give the students more autonomy in the creation of their project ideas.
2. This study provides insights that can serve as reference for educators to help students formulate project ideas.

References

Heckendorn, B. (2010). Building a Beowulf: Leveraging research and department needs for student enrichment via project based learning. *Computer Science Education, 12*(4), 255-273, doi: 10.1076/csed.12.4.255.8620

Manning, G. (2007). Self-directed learning: A key component of adult learning theory. *Journal of the Washington Institute of China Studies, 2*(2), 104-112.

Heong, Y. M., Yunos, J. M., Othman, W. Hassan, R. Kiong, T. T., & Mohamad, M. M. (2012). The needs analysis of learning higher order thinking skills for generating ideas. *Procedia-Social and Behavioral Sciences, 59*(10), 197-203.