Position Paper

Pro Guided Discovery Learning

Wikipedia sites discovery learning as a type of inquiry-based instruction where the learner is in a problem solving situation and must use prior knowledge and experience to “discover” the solution. Wikipedia does not specify to what degree the teacher helps or directs the learner. Perhaps wisely, they have chosen to stay out of that argument. Most inquiry-based methods of instruction have varying levels of teacher involvement from almost none (the students propose questions for investigation, methods of investigation, carry out their plans and evaluate their results) to almost all (previous mentioned activities are conducted by teacher except for the carrying out of the experiment). While it is desirable that students move toward expert status as posited by How People Learn and be able to construct their own questions and answer them through experimentation or research; that is the end game and our students are not experts yet. Thus we begin at the other end of the spectrum where discovery learning is highly ordered and guided by the teachers. As a teacher, I want to move toward the goal where my student is an independent learner and can essentially carry out a science fare experiment with little to no help. Most of my students never get there (at least not in the 8th grade when I have them). In fact, most adults require some sort of direction and guidance when embarking on new projects. It would be naïve to expect students to magically orient themselves to the exact things we want them to discover during inquiry activities. I strongly support the need for teacher guidance and strategic questioning of students in order to make discovery learning meaningful for them.

Arguments for Guided Discovery Learning

Among the many needs of students, one of the most important to address is misconceptions. In fact students will often have misconceptions and not know they have them. It becomes our job as teachers to draw these out and make them visible to the student. Without guidance, students will be
unable to relate their discovery activity to their misconception and thus leave their misconception intact for another day or misuse. One of the methods that How People Learn advocates is called conceptual change. For students to undergo this conceptual change, they must be confronted with their misconception and forced to apply it to a situation that can’t be solved by their misconception. If the teacher gives the student no guidance during the activity, students may solve the particular problem; however, they may not realize that they have disproven their own misconceptions. Allowing students to voice the meta-cognitive process requires guidance by the teacher and is essential to addressing misconceptions and integrating them with new knowledge that can allow the student to build upon their experience. It is much like asking students to make a prediction, and write down why they think a particular outcome will happen. This forces students to reflect on their own thinking. The role of the teacher is to provide opportunities for students to reflect upon their own thinking. One of those opportunities arises when it is time for the students to evaluate their own discovery against scientific ideas. Without teacher guidance, this would not happen. The teacher must intervene at the end of the activity and provide the student with appropriate source material or at least guide them to seeking said material so that the student can compare their own results with others’.

Then there are those students who are completely lost and have no prior knowledge let alone misconceptions about the particular idea that they must “discover”. I find this to be true about students of mine that have only recently come to this country but did not attend any type of school in their home country. These kids need direction, in the least a guiding question, or a purpose for the activity. Otherwise I often find that these students will play and play with the materials and discover many things of interest, and generate many questions still. This is a wonderful exercise in the scientific process, but ultimately, can only be done once or twice until the teacher realizes that the student has casually discarded the one discovery that was most important for the lesson. Giving students a reason for the experiment, an expectation that they will find the answer to some question allows the student to
conduct their activities purposefully. In particular, I recall the open discovery activities conducted by E. Duckworth with adult students. After eight weeks of experimentation in a very non-guided, discovery oriented method, even Duckworth (2001) realized that in the end the teacher must frame the lesson and allow students to have some amount of background knowledge, “The critical experiments themselves cannot impose their own meanings. One has to have done a major part of the work already. One has to have developed a network of ideas, into which to embed the experiment” (p.39). The amazing part about this realization is that Duckworth was working with adults who did have background knowledge. Our students on the other hand, may have far less background knowledge, and thus will need much more guidance.

Included with my previous argument for guided discovery learning are my great English language learners, otherwise known as ELL students in the Los Angeles Unified School District. I have many ELL students and they can be very challenging to teach. I’ve watched ELL students during discovery activities – it’s a mixture of excitement with pure confusion. Just as I argued earlier, the need direction or they won’t make head or tails of it. Even if they do have prior knowledge, the fact that they don’t know what they are expected to learn can be a distracter. ELL students often do not integrate new situations comfortably into existing knowledge because of the language barrier. The students need a lot of scaffolding and discovery activities can easily lend themselves to this with teacher guidance.

My third argument for guided discovery learning stems from the differences between experts and novices as outlined in How People Learn. According to How People Learn (1999), experts recognize patterns in information; they can retrieve facts and apply them to particular situations when necessary; and they do not have memorized isolated bits of facts, but a network of knowledge about different domains. Since most of our students are still novices, they have a harder time recognized patterns and connecting newly acquired knowledge with previous knowledge in order to build that “web”. Our
students take in knowledge as isolated little bits that have nothing to do with each other. It is up to us as teachers to ask those probing questions that can lead students to connect little facts and make them into huge ideas. Discovery activities on their own are just that, on their own; many kids do not realize that yesterday’s activity is related to today’s activity. A teacher can easily address this lack of connection with a little guidance, perhaps a well placed question or a discussion about the purpose of the activities. Nothing of the discovery activity need be revealed except that which can help the student frame it into prospective thus allowing them to integrate their discoveries into a large network of knowledge. Our students need to constantly be reminded of the big picture in order to contextualize all these new discoveries.

My last argument could summarize the various studies that Mayer sites that have shown guided discovery has benefited students more that open discovery, or even site the research that I have found (such as Hardy, Jonen, Moller and Stern), however I’d rather advocate a form of guided discovery learning called inquiry learning (IL) and project based learning (PBL). Both IL and PBL are highly scaffolded types of discovery learning. The can vary in how guided they are, however, they easily fall into the constructivist ideas of discovery learning while at the same time providing support for the student to comfortably build upon their knowledge. These are highly viable alternatives to pure discovery learning. As outlined in Inquiry and the National Science Education (2000), it is recommended that teachers ask guiding and probing questions during inquiry activities as a means of enabling students to refine, revise and extend their understanding and learning.

Possible Opposition

“Where is the line between guided discovery and just lecturing and giving answers away? What you are advocating is an old fashioned didactic methodology!” Here is my response: Sometimes kids need background knowledge, it takes careful work and time to prepare guiding questions for discovery
learning. Often it is necessary for teachers to intervene during discovery learning when students need a bit of background knowledge for topics that may be completely new to them; after all, we are the resident “experts”. Teachers should anticipate possible roadblocks to discovery learning ahead of time and prepare well constructed questions that can help students connect the activity to prior knowledge or lead them to a path towards the solution. Just as pointed and well planned questions can help a lecture, they can do the same for inquiry or discovery activities.

“It’s not discovery anymore, it’s just cookbook science!” My response is this: Guided discovery is a long way off from cookbook science. Guiding questions do not have to translate into step by step directions of how to do an experiment or how to solve a problem. Guiding questions can simply point students to thinking about a situation that can lead them towards a possible solution. A teacher can frame a discovery activity without giving away crucial details that can be discovered by the student through the process of trial and error. In fact, the easiest way to ensure you are not doing cookbook science is to take out the procedure from any laboratory. Allow the students the time to discover the method by which to solve the problem. The key is to provide a context that students can operate within and to give them a goal or a purpose for their activity. As long as the purpose holds the students’ interest, they will be driven enough to continue with the discovery process. How do you hold the students’ interest? The teacher can allow the students to take part in choosing the purpose of the activity. In fact to have a class discussion that is carefully facilitated by the teacher regarding the purpose of a discovery activity can yield wonderful results that do not resemble a cookbook lab at all.

Conclusion

I have provided four arguments in favor of guided discovery learning. Those four arguments outline why I believe that discovery learning should occur with teacher guidance and not go on open ended without any clear purpose. Guided discovery learning provides the teacher with an opportunity to
address misconceptions head on during activities and prompt students to confront their own misconceptions by making them visible to the student. The teacher can support the learning during discovery activities by providing a context and purpose for those students who have no background knowledge regarding the topic or problem. The teacher also can support ELL students with guidance during activities and discussion to make them feel more comfortable during group work. Many books about ELL teaching strategies stress the importance of teacher support during the process of integrating academic language within discovery activities. Lastly, since most of our students are novice learners, they require our assistance as resident experts in order to recognize patterns, connect ideas and build a true network of knowledge. With our expert guidance, students can slowly make their way to eventually becoming expert learners. Discovery learning can truly be an enlightening experience, if students are simply given little hints at what exactly they are *supposed* to be learning.
References


