Self-Theory of Instructional Design

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Abstract

This proposed self-theory of instructional design aims to make students become lifelong learners who are able to transfer school learned knowledge and apply it outside of school in different contexts. Inspired by the knowledge integration perspective, the theory incorporates several elements from major instructional design theories, including anchored instruction, contrasting cases and metacognitive theory. The instruction process begins with a realistic challenge which requires learners to solve by combining inert knowledge with targeted new information. Second, create a supportive social environment with scaffolding in order to foster learner metacognition. Third, use contrasting cases and time for telling to analyze all potential solutions. Last, assign learner metacognitive reflections as the final learning goal assessment. This theory emphasizes the values of knowledge transfer and metacognitive processes in problem-solving for learners, as well as stresses the importance of realistic learning environments and the implementation of a variety of instructional strategies for instructors.

Theory Learning Goal

As educators, one of our main goals should be to teach students to become independent problem solvers on their own. In other words, we should provide students with the necessary knowledge as tools to solve problems outside of the school context. Therefore, it is essential for us to create lessons which encompass practical applications of school learned knowledge so these skills can be retained and transferred in different contexts. My proposed instructional design theory has explicitly practical learning goals that are mutually established between instructors and learners. In other words, the instructors lead the group of learners to solve a practical real life scenario that contains a challenge which would need to be resolved using a combination of inert knowledge transfer and targeted new information. The theory's learning goal is to make students become lifelong learners who are able to transfer school learned knowledge and apply it outside of school in different contexts.

This learning goal should be made explicit to both the learners and the instructors so that as the class is going through the challenge together, everyone will be intrinsically motivated to complete this meaningful task. By establishing the mutual understanding that this task is meaningful and applicable in real life contexts, learners will become motivated to retain the knowledge acquired after the lesson is over, and instructors will scaffold the learning process with the mindset that this is important information he or she is delivering. Hence, this mutual understanding should provide strong intrinsic motivations for both the instructor and the learners to complete the challenge together.

Instruction Process

Inspired by the essence of knowledge integration theory (Linn, 2006), which combines key elements from a variety of disciplines, my theory combines multiple instructional design theory elements into a comprehensive learning process. The first component of my instruction process starts with the challenge component in anchored instruction, which aims to overcome the inert knowledge transfer problem by creating environments that permit sustained exploration and enable the class to understand the problem and knowledge (The Cognition and Technology Group at Vanderbilt, 1990). The presentation of a real life scenario as the challenge should require learners to compose solutions using inert knowledge transfer and targeted new information.

Second, based on Lin's metacognitive theory, instructors should create a supportive social environment for learners to deepen their own self understandings (2001). Since my theory's ultimate goal is to make students become lifelong learners, they should be made aware of the internal thought process during problem-solving. Therefore, instructors should focus on creating a supportive social environment for learners to harvest this metacognitive activity.

Third, mirroring the contrasting cases theory proposed by Schwartz & Bransford (1998), instructor should start with a comparison of all the different potential solutions as the contrasting cases, then analyze all the different solutions as the time for "telling" to ensure learners are actively connecting inert knowledge with the targeted new information.

Last, in order to ensure learners have reached my theory's learning goal, I propose to assign written metacognitive reflections to individual learners to assess their achievement after the lesson. This written reflection should explicitly ask learners to think back to the steps taken in order to solve the challenge. In other words, this written reflection aims to assess whether learners are able to trace back the steps taken to solve a problem. The reflection also ensures learners have the ability to solve the problem again on their own in different contexts.

To summarize previous points, the instruction process should proceed in the following steps:

- Present the challenge in which a real life scenario poses a problem that requires a solution using a combination of inert knowledge transfer and targeted new information
- Create a supportive social environment for the learners and guide their collaborative problem-solving process with scaffolding
- Analysis of challenge solutions as the time for telling to ensure learning goal is achieved
- Conduct learner metacognitive reflections as the learning goal assessment

I) Present the Challenge

Instructors should begin by presenting a real life scenario which encompasses a challenge to the learners. The challenge needs to be a meaningful, authentic task so that students can utilize a combination of inert knowledge transfer and new information. For instance, if a math teacher is teaching a lesson on probability and the calculation of averages, then the challenge could be that the students are on a baseball team, and the coach needs them to help him figure out how to calculate each player's batting average. The students need to figure out how to apply the probability calculation (e.g. targeted new information) and inert knowledge (e.g. addition, multiplication and division) to calculate the batting average of each player.

When presenting the challenge, it needs to be informative just like in real life. The challenge will include all the necessary information that is required to solve the problem. For instance, referring back to our previous example, the necessary information for that challenge would be the scoring table of each player from the previous game so that the students can use the statistics from the table to calculate the batting average of each player.

The challenge should be presented in a variety of ways so that learners can absorb the information and understand the problem fully in different contexts. For instance, it is recommended that if resources permit, the teacher can present the challenge using interactive media such as video or animation that stimulate multiple humans senses, so the learners could absorb the content and information through different channels of their brain. However, if resources are limited, a simple paper written scenario would suffice in introducing the challenge. Nevertheless, the teacher would need to elaborate on the context of the problem with narration and background story regarding the challenge so that every learner is fully aware of the information presented in the challenge.

II) Create a Supportive Social Environment & Provide Scaffolding

If the theory's ultimate learning goal is to make students become lifelong learners who are able to transfer school learned knowledge and apply it in different contexts, then metacognition activities are an essential component in our design. According to Lin, the two basic approaches to supporting metacognition are strategy training and creation of a supportive social environment, and when students are engaged in metacognitive activities, their learning is enhanced (2001). Therefore, in order to enhance student learning, we must create a supportive social environment for metacognitive activities so that they can carry over the same skills they learned into different contexts.

We can create a supportive social environment by breaking the learners into small groups of four so each of them can share their thoughts and ideas for resolving the challenge with their peers. The instructor can assist by going around guiding and answering each group's questions. For example, if a group requires additional information about the challenge or has trouble narrowing down the problem within the challenge, then the instructor could go around to different groups and provide extra assistance as well as provide scaffolding. Referring back to our previous example, if a group requires additional background knowledge on how to read the statistics of the player's batting performance or does not understand the basic rules of baseball, then the teachers could provide additional background information as well as explain why calculating batting average is advantageous for the team. The instructor's main goal during this step is to provide the appropriate level of scaffolding for each group.

It is also important for the instructor to note the metacognitive process of each group when they are coming up with the proposed solutions. Metacognitive strategies such as verbal prompting are useful for tracking each group's thought process in problem-solving. The main reason for focusing on the learners' metacognitive thought process is so that we can compare and contrast the different ways people solve problems. This again ties into our ultimate learning goal, which aims to make students become lifelong learners who can solve problems in different contexts.

III) Analysis of Challenge Solutions & Telling Using Knowledge Integration

After appropriate time is given, the groups can now come together as the whole class and share each other's proposed solutions. The larger group's brainstorming process provides contrasting cases for multiple perspectives. It is important for students to understand that most of times in real life there are multiple solutions to the same problem. Therefore, by establishing a mutual understanding within the class that there is no “wrong solution”, it also reassures the supportive social environment for brainstorming.

According to Schwartz & Bransford, analyzing contrasting cases can help learners generate the differentiated knowledge structures that enable them to understand a text deeply, and teaching by telling can deepen student understanding (1998). Therefore, it is essential for instructors to attach the “Time for Telling” component following the contrasting cases in order for the learners to achieve deep understanding.

By contrasting each group’s metacognitive processes for problem-solving, we can compare different ways of how people attempt to solve a problem. Referring back to the probability challenge example, some students may choose to organize the batting statistics using addition and division, while others may choose to organize the statistic using fractions. By examining different problem solving metacognitive processes, students can learn about different ways to resolving the same problem.

During this stage of the process, instructors should have a rough idea of each group’s metacognitive problem-solving process as well as their proposed solutions. According to Linn’s knowledge integration perspective, “variety is the spice of learning” and different learners need different learning strategies in order to successfully internalize new ideas (2006). Therefore, multiple teaching strategies such as critique, collaborate and reflect should be incorporated during the analysis. By integrating a variety of teaching strategies, different learners will understand how others perceive to solve the same problem.

IV) Learner Metacognitive Reflection as Assessment

After the class has participated in the solution analysis together, we can move onto individual metacognitive reflections as the end assessment to ensure all students have achieved the ultimate learning goal. Although the analysis would provide instructors with a general overview of the class’ problem-solving thought processes, instructor should still ensure every individual in class are actively thinking back to their own thoughts.

Lin stresses that students do not spontaneously engage in metacognitive thinking unless they are explicitly encouraged to do so through instructional activities (p. 24, 2001). Therefore, I would suggest instructors assign each student a writing assignment which includes a review of the challenge, reflection of the thought process of how their group came to propose a potential solution, and their own thoughts after the whole class has shared their solutions. I would recommend this final assessment to be a written assignment so each learner would be able to go through his or her own metacognitive process more thoroughly and deeply. Furthermore, instructors can also explicitly request learners to think about how the skills learned can be transferred onto different contexts, which reassures the theory's ultimate learning goal.

In addition to the written reflections being an assessment for the learner reaching our ultimate learning goal, by reviewing the written reflections of individual learners, instructors will also be more aware of each learner's thought processes as well as learning styles. This valuable information can be used to custom design future lesson plans. Prior to the start of a lesson, each learner will enter the class with his or her own set of preconceptions, values and prior knowledge. Instructors who know more about their students will be able to deliver more effective lessons and adjust each lesson's learning goal according to the class dynamics.

Variables in the Theory

There are a few variables within the theory which may influence the effectiveness of achieving the learning goal. First, the over comprehensive context of the challenge increases the chance of incidental learning. In other words, since the challenge is broad and there may be multiple solutions to the same problem, the targeted new knowledge (e.g. probability mathematics formula) may not be utilized as expected. Allan Collins mentioned that he prefers to "create as engaging tasks as possible that reflect the uses of the knowledge to be learned, and let any facts and concepts be learned incidentally" (1996). My theory follows the same value as Collins, and uses the challenge as the "engaging task." It is only a natural part of learning for additional facts and concepts to be picked up incidentally by the learner. However, the chance of incidental learning should be minimized with the instructor's proper guidance and scaffolding following the challenge. Furthermore, analysis of the solutions process acts as the direct instruction portion of the lesson that ensures learners understand the targeted new knowledge.

Second, different groups' proposed solutions may provide multiple perspectives to the challenge, but it may be overwhelming for novice learners who have limited prior knowledge. Different learners come into the lesson with various levels of prior knowledge. For a notice learner with limited prior knowledge, he or she may be overwhelmed by the number of options provided by different groups, thus "watering down" the focus of the lesson. For example, for a novice learner who has no prior knowledge of a baseball game, he or she would not be able to absorb all the information about batting averages. In order to prevent this from happening, instructors should provide proper guidance and scaffolding depending on the learner's current knowledge level. Since the theory aims to imitate real life challenges, it is very applicable for students to consider all variables within a problem before choosing the best solution. Nevertheless, the instructors should always act at the guide to ensure the class stays on track, considers all variables within the challenge, and understands the targeted new knowledge.

Third, when too much value is placed on the problem solving thought process over the actual solution, the extra strenuous metacognitive reflections may cause students to lose their motivations for completing the challenge. Instructors can minimize the reduction of motivation by stressing the importance of overcoming this challenge. In addition, putting more value on the internal thought process over the actual result will make students find out more about themselves as learners. Therefore, this further helps fulfill the theory's ultimate learning goal, which is to make students become lifelong learners.

Last, the challenge may over contextualize how the targeted new knowledge is applied thus reduce the learner's ability to transfer this knowledge in different contexts. This last point may seem counterintuitive to the theory's ultimate learning goal. Nevertheless, if the challenge is overly detailed for the students, sometimes it will be difficult to apply the same knowledge in different contexts. For instance, if the students understand how to calculate batting averages, they may remember to transfer the same technique onto different sports, but forget to transfer the same knowledge onto a game of roulette.

The knowledge transfer ability can be enhanced with scaffolding during the solutions analysis process, or as mentioned previously, some instructors may choose to explicitly request learners to think about how the skills learned can be transferred to different contexts during the written reflection assessment. The instructor will decide whether knowledge transferability needs to be explicitly assessed depending on his or her own judgement of the class during the solutions analysis.

Conclusion

My theory aims to teach students to become lifelong learners who are able to transfer school learned knowledge and apply it outside of school in different contexts. The theory implements various elements from major instructional design theories, including anchored instruction, contrasting cases, metacognitive theory and knowledge integration perspective.

The theory's instruction process first begins with the presentation of a real life challenge that requires learners to compose a solution by combining inert knowledge transfer with targeted new information. Second, instructors should create a supportive social environment with scaffolding which fosters metacognitive activity while learners generate a potential solution to the challenge. Third, instructors should summarize all the potential solutions using contrasting cases followed by a time for telling to ensure learner understanding. Last, instructors can assign individual metacognitive reflections in written format as the final assessment of the theory's learning goal.

The instruction process attempts to reflect real life problem-solving scenarios so that learners will be able to see how school taught knowledge is applicable in real life. The theory emphasizes the values of knowledge transfer and metacognitive processes in problem-solving for learners, and stresses the importance of realistic learning environments and the implementation of a variety of instructional strategies for instructors.

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