

Faculty Innovator Grant 2017
Center for Learning and Teaching

Final Report Form

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Project Title: (10 words or less)	Creating external representations to support reflection-in-action via Cacao

Other faculty:

Faculty Name:	Department	Email Address	Office Phone Number
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1. Describe the specific teaching and learning issues being addressed by the proposal.

To assist ODU students in preparing for an ever-evolving, complex world, classrooms need to accurately reflect the real world. This means that ODU classrooms focus on ill-structured problems and problem-solving. We looked to help students engage in problem-solving, reflection, and ideation in the classroom.

Reflection-in-action emphasizes that unique and uncertain situations are understood through attempts to change them, and changed through attempts to understand the situations. When students think on their feet, keep their wits about themselves and learn by doing, students can not only think by doing but can think about doing something while doing it. Reflection-in-action aligns well with a design thinking and authentic learning approach to facilitate problem-solving, ideation, and iteration. When students can produce external representations (sketches, models, diagrams, graphs, etc.), they take stock in and react to their external representations. External representations are based on real life and invite students' interpretation. Here, real-life situations mean that external representations account for design context and constraints. Informative and engaging external representations provide information to the student and are expressed openly enough to allow for interpretation.

Cacoo, an online diagramming and mapping tool, provided an authentic learning environment where students, working in groups, visualized, reflected-in-action, ideated, and experienced the true iterative process of problem-solving. We piloted the use of Cacoo in the academic year 2015-2016. Our pilot studies affirmed the success of using this tool for creating external representations to support reflection-in-action. We used Cacoo again (during the 2016-2017 academic year) with modifications suggested by data from the pilot studies.

2. Describe the revised specific teaching and learning issues being addressed by the proposal (if applicable):

Principles of Human Performance Technology (IDT 730/830) is a graduate course that introduces students to the field of Human Performance Technology (HPT). Students explore what HPT is, why instructional designers should know about it, how performance improvements can be measured, and most critically, how HPT can be applied in real environments to solve real problems and engage real opportunities.

This distance learning class uses both Blackboard and WebEx. The class alternates week to week between Blackboard and WebEx. WebEx classes occur at Gornto where some students physically attend the class and other students attend via WebEx.

Overall, the course has nine learning outcomes:

1. Define HPT.
2. Discuss the origins and evolution of HPT.
3. Justify the selection of specific HPT tools for use with specific models.

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4. Analyze organizational goals and processes in order to identify performance gaps.
5. Identify human performance interventions that are not instructional.
6. Identify human performance interventions that are instructional.
7. Develop metrics for measuring and evaluating performance impact.
8. Discuss emerging trends in HPT.
9. Discuss standards, ethics, and legal implications of HPT.

More specifically, of the nine course outcomes, we focused on the following three learning outcomes that related directly to the course:

1. Justify the selection of specific HPT tools for use with specific models.
2. Analyze organizational goals and processes in order to identify performance gaps.
3. Design human performance interventions that are instructional and/or not instructional.

In addition, we focused on the following three learning outcomes that related directly to Cacoo - the online diagramming and mapping tool:

Through reflection-in-action, students will be able to:

1. Collaborate with peers visually map out findings.
2. Collaborate with peers to represent visually at least two performance intervention drafts.
3. Collaborate with peers to represent visually a final intervention implementation plan.

The relevance of these learning outcomes involved assisting students in developing and sharpening problem solving skills. When designing solutions like HPT interventions, designers rely on external representations to guide them through the design process.

3. Describe the development activities involved addressing the learning or teaching issue.

Based on results of data collected from a pilot study, we allocated more time for students to practice the use of Cacoo before the design assignment. After spending the first 10 weeks establishing a strong human performance technology (HPT) framework and practicing with Cacoo during Blackboard assignments, in week 12 students faced a case of a fictitious company that has a variety of HPT issues. Working in teams of two, students developed an intervention implementation plan that included one intervention.

In the week 13 WebEx class, teams presented their first external representation drafts, which were completed using Cacoo. In the second part of the class, the instructor played the president of the fictitious company and, in character, answered team questions.

Teams asked as many questions as needed to identify and prioritize performance gaps at the organization, process, and job levels.

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In week 14, students collaborated in Blackboard. Again using Cacoo, teams posted their second external representation draft. Reacting to the external representations, other teams provided constructive feedback.

In preparation for week 15, continuing to use Cacoo, each team finalized its intervention implementation plan. Using a Cacoo feature, students saved all design iterations leading up to the final design.

During the week 15 WebEx class, each team presented and defended its intervention implementation plan.

4. Describe the learning outcomes attained by the project.

Overall, the course has nine learning outcomes:

1. Define HPT.
2. Discuss the origins and evolution of HPT.
3. Justify the selection of specific HPT tools for use with specific models.
4. Analyze organizational goals and processes in order to identify performance gaps.
5. Identify human performance interventions that are not instructional.
6. Identify human performance interventions that are instructional.
7. Develop metrics for measuring and evaluating performance impact.
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In addition, we focused on the following three learning outcomes that related directly to Cacoo - the online diagramming and mapping tool:

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1. Collaborate with peers visually map out findings.
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5. Describe unexpected outcomes, if any.

We had learned from the pilot that students felt it was important to practice with Cacao prior to the design project. In week 3, students designed their HPT model using Cacao. This helped them get familiar with Cacao.

6. Describe the impact of the completed project on your colleagues, department, college, or community.

This project is reproducible and well-applicable in university-wide majors and disciplines and various learning contexts where students can be highly engaged in higher-level learning through producing visualizations of their own thinking and thought process. Within the Instructional Design & Technology program, we have used this approach to projects in other classes.

At the 2017 Association for Educational Communications & Technology Convention in Jacksonville, FL, we held a concurrent session discussing the results of our research and the practical applications of using Cacao to drive external representations and reflection-in-action. We had 20 people attend our session.

Our research has resulted in one journal article:

Baaki, J. & Luo, T. (2017). Stimulating students' use of external representations for a distance education time machine design. *TechTrends*, 61, 355-365 doi: 10.1007/s11528-016-0155-z.

We have an additional article under review and are currently making revisions to a book chapter.

7. Describe how the project can be a model, template, or prototype for use by other instructors.

Applications are as plentiful as an instructor's creativity. It is flexible enough to be adapted for any type of class and class initiative. It could be a stand-alone learning experience covering one to three weeks, or it could be a part of a semester-long class project that has specific and multiple milestones. Ultimately, this project can affect a significant number of students due to its wide applicability.

8. Describe the technology used to help address the issues described in the proposal.

The selected technology for this project was Cacao, a user-friendly, online diagramming and mapping software available free of charge for students, teachers and educators. Cacao is a widely-utilized tool for modeling, representing and visualizing information.

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Among other uses, maps and diagrams are commonplace in the context of human-performance based training and development to represent free drawing, outlines, design prototypes, workflows, software architecture and organizational charts. Cacoo is an ideal tool to use in addressing HPT issues.

Being an online, cloud-based program, Cacoo possess the ability to save instantly external representations, which is important in an iterative process. The collaboration features allow students to communicate with one another through chatting and easy-sharing, which is critical to reflection-in-action and reacting to external representations. As Cacoo is a lightweight, web-based program, it can be easily adapted in any setting, including face-to-face in classroom (students can work on their laptops), asynchronous learning environments (such as sharing links or embedding graphs in discussion forums), and any synchronous, web-conferencing learning environments (such as in WebEx) by opening and sharing a browser window.

Comparatively speaking, there exist plenty of other types of mapping and diagramming software. The Cacoo free version offers many “bells and whistles” that other similar technologies do not have. Many of the other mapping and diagramming tools are proprietary or offer very limited features for the free version. Others require heavy installation or are clunky to use. It is also worth noting that Cacoo has a free educational plan that make all features and functionalities available to teachers and students. The following chart demonstrates a comparison between what Cacoo and other mainstream, popular mapping tools can offer.

9. Describe products, if any, that are a result of the project.

There were no products as a result of the project.

10. Describe the future plans for this project, if any.

We continue to plan to use the external representation process for design projects in out instructional design courses. We have found that students enjoy the flexibility to use their tool of choice to develop external representations. We share Cacoo as a tool but do not require students to use it.

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11. Attach a financial report with updated Budget Plan Matrix.

Final Budget Matrix

Budget Item (equipment, personnel, software, etc.)	Qty	Total Cost	Source of Funds	
			Amount from FIG	Amount from Other Source
Stipend for Dr. Baaki to do research	1	\$900	\$900	
Stipend for Dr. Luo to do research	1	\$900	\$900	