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Task Analysis

Part 1: Introduction

For my first task, I chose making chocolate chip cookies. The task altogether is simple; however, it requires specific measurement tasks as well as other subtasks to be completed. The use of an oven is where controls and displays come into play. Errors may occur when the user interacts with such controls and displays, however they are not necessarily detrimental to the task. There are many places where mistakes can be made which could lead to a bad product. Through this task analysis, I plan to show where in the process these mistakes can occur and their associated repercussions. I am familiar with baking as a hobby. Doing a hierarchical task analysis on this task will force me to think beyond following step-by-step instructions. Most of my baking does not require me to go step-by-step anymore because I complete the task often. When a task becomes monotonous, in a sense, more errors may be made. In baking, these mistakes can be detrimental to the product or detrimental to the human performing the task.

I chose setting up a Thule rooftop tent for the second task. Performing this task is not necessarily difficult, but there are a lot of pieces involved. The tent itself does not have any controls involved, however, the use of a cell phone may be necessary for the completion of the task. This is a perfect task to complete a hierarchical task analysis (HTA) on because multiple options for set-up are available to the user. These options can be chosen based on comfort, ease of use, as well as safety protocols. The safety protocols are listed on parts of the tent that must be used. These are important for users to recognize when setting up the rooftop tent. The options the user must choose from may result in different follow-up tasks. The HTA will allow me to express these subsequent tasks in detail.

Part 2:

The main task of baking cookies begins with six sub-tasks. First, the user must set up all the equipment necessary. The equipment includes the recipe, a baking sheet, a KitchenAid mixer, three bowls, measuring spoons, a 1 ½ tablespoon cookie dough scooper, and a spatula. The user may have limited access to resources; therefore, a hand mixer can be used. There are controls included on both the KitchenAid mixer as well as the hand mixer. The user must control the speed at which the mixers perform and visually perceive if the speed is too fast, slow, or just right. Visual perception is important because if the mixer is going too fast, ingredients might fly out of the bowl. Visual perception also helps the user know when the dough is thoroughly mixed. When they see that the dough is mixed, they will know to stop. Overmixing can cause flat cookies.

Second, the user must pre-heat the oven. Depending on the product type wanted, the temperature may change; the standard temperature, however, is 350^{o} Fahrenheit. Completing this subtask is where controls and displays are used. There is a specific set of steps to follow when setting the temperature. If one step is missed, the oven will not start the pre-heat. To begin the user must push the button that says bake. Following this, they must adjust the temperature using the plus and minus buttons to reach their desired temperature. Finally, they must push the start button. The user must have a mental model of what pre-heating is and recognize the controls used. There is not a specific button on the oven that says pre-heat. Additionally, there is not a specific procedure or instructions listed on the oven, therefore, the user must figure out that the “bake” button is the one to use. A novice user may not know how to preheat the oven especially if they are looking for a button that expresses this.

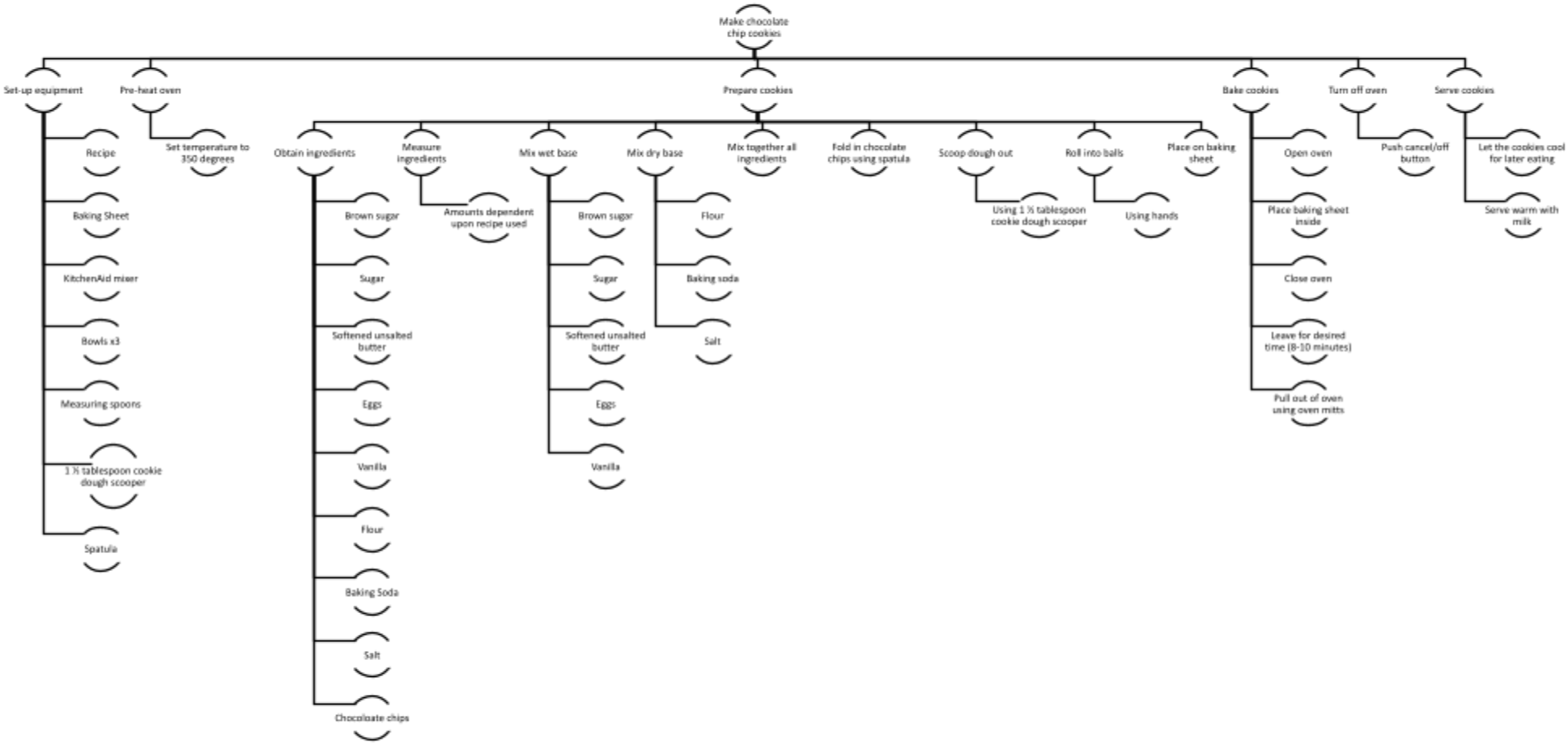
Third, the user must prepare the materials that go into the chocolate chip cookies. Ingredients include a variety of things like flour, brown sugar, chocolate chips, etc. In order, the user must obtain the ingredients, measure them, mix the wet base, mix the dry base, mix all the ingredients together, scoop the dough out and roll it into balls, and place them on the baking sheet. This is a lot of sub-tasks to be completed properly. The most important part when preparing the ingredients is measurement. Baking requires the user to stick to a strict recipe. For example, if the user uses more flour than the recipe calls for, the cookies will not turn out properly. The speed-accuracy trade-off is important here, because if the user is going too fast, they may use the tablespoon instead of the teaspoon. The measurement would no longer be accurate, and the recipe is ruined.

Fourth, the user must bake the cookies in the oven. The steps included are simple, but safety is important here. The user is working with an extremely hot piece of equipment and must take precautions when doing so. After opening the oven, the user must place the baking sheet inside the oven on a rack. All items inside the oven will be hot, therefore, the user should not touch them. Even though the baking sheet is not hot, it may be precautionary to use an oven mitt in the event their hand gets too close to the rack or door of the oven. The risk/benefit tradeoff must go through the mind of the user. Does the risk of potentially burning one's hand yield the need for the oven mitt, or will they be okay without it? Once the baking sheet is in the oven, the user must close the door and set the timer. This goes back to the controls and displays. The timer controls are simple in comparison to the pre-heat controls. All the user needs to do is push the timer button and adjust the time using the plus and minus buttons. Once the desired time is shown, the user must know to push the timer button again. If the timer button is not pushed, the timer will not start. If this is not built into the user's mental model, then this action may not be performed. The time will not start, and the user will not know when the cookies are done. A safety problem includes possible fire if left too long. Otherwise, the user may just get overcooked or burnt cookies. If all steps are performed properly, the user can pull the cookies out of the oven using an oven mitt and place them on the stove. The risk/benefit tradeoff is used here as well in a similar manner as before, however, it now includes the risk of extremely burning one's hand on the hot baking sheet. It is highly recommended to use the oven mitt.

Fifth, the user must turn off the oven. This task is one of the simplest sub-tasks but is likely to be forgotten. Once the cookies are out of the oven and the door is closed, the oven needs to be turned off using the controls and displays present on the oven. The button is intuitive in nature and says "cancel/off." This button needs to be pushed once and the display will go back to the original display of time when this action is completed. If the user does not turn off the oven, there is the potential for a fire which would be a safety risk and unintentional injury may occur.

Finally, the user must serve the cookies. There are two ways to serve cookies, the user can either let the cookies cool for later eating or they can serve them warm with some milk. There is not much that goes into serving cookies, so safety and cognitive issues do not really play a part. Deciding which way to serve the cookies is the most difficult decision the user will have to make in this subtask.

Hierarchical Diagram- Making Chocolate Chip Cookies

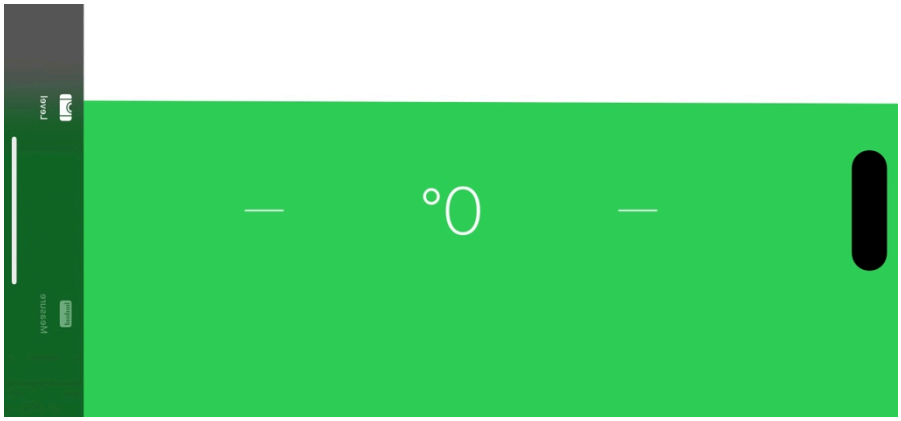


Part 3:

There are a total of four subtasks that need to be completed to set up a rooftop tent. First, the user must attach the tent to the roof of the vehicle they will be using. The user must manually lift the tent onto the roof of the vehicle. Once the tent is on the roof, the user must adjust the tent to be centered on the vehicle. Next, they will secure the T-bracket system using bolts. They need to finish the task by tightening the bolts using a ratchet tool. Some large safety precautions must be taken when manually lifting the tent onto the roof. The tent is very heavy and will need at least two people to lift it. The risk/benefit tradeoff plays a large part in this task. The fewer people there are lifting the tent onto the roof of the vehicle, the more risk there will be for injury. Depending on the height of the vehicle and the height of the user, the tent might have to be lifted above their head. This may result in spinal injury, head injury, or other bodily injuries if the tent is dropped. The user must decide whether they want more help and how many people they will get assistance from. The result should look like the image below (Image 1).

Second, the user will need to drive to their desired camping location. To complete this subtask, the user will need to find a place where there is enough room to fit the tent when it is open. This subtask heavily relies on episodic memory. The user must be able to look at the space without the tent set up and decide whether it will fit or not. Therefore, this task is incredibly difficult if the user has no previous memory or knowledge of how large the tent is when fully opened. There cannot be any trees that hang over the tent at a low height and there must be plenty of room on the side that the tent will be opened. Room on the sides of the tent is important for the final subtask of setting up the tent. If the user has completed the task of setting up a rooftop tent, then they may use top-down processing when making the decision. They will be able to compare the current spot to a previous spot they have used. Once the spot has been chosen, the user must pull into the spot and park the car.

The third subtask is one of the more complicated ones. The reason for this is that completion of this task will set the stage for the final subtask. If this is not done properly, safety issues will arise. The user must level the vehicle before setting up the tent because of two main reasons; the first is because they will not want to roll or slide while sleeping and the second is for ladder safety. Regarding ladder safety, a leveled vehicle will keep the ladder level for safe climbing in and out of the tent. It is important to note that the level of the vehicle does not have to be a perfect zero degrees, however, the user must get as close as possible to it. There are two different ways the vehicle can be leveled; a measure app on a smartphone can be used or the user can "eyeball" it. When using the measure app on a smartphone, displays are involved. Below is an image of what the measure app looks like on an iPhone 14 (Image 2). It is intuitive in nature and follows a user's mental model of how a level works. The movement of the phone will change the degrees to which the level shows following the Principle of the Moving Part. Once the user is familiar with the way the app works, they can use it to help them level the vehicle. The best place to hold the phone is on top of the packed tent; this will give you the flattest surface. If the level shows zero degrees, then the user can move on to the final subtask, however, if it isn't, then they should consider changing the position of the vehicle until it is as close as possible.



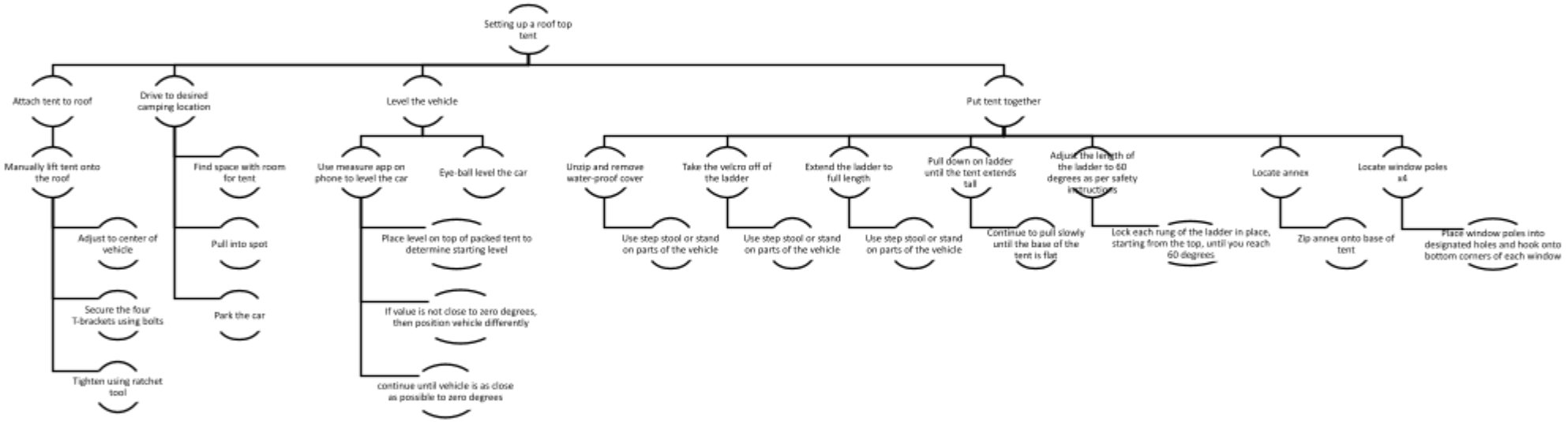
(Image 2)

Finally, the user must put the tent together and this is the most complicated subtask to complete. Many things need to be set up and they do not all have to be completed in a specific order; therefore, cognitive limitations may arise. The steps and processes may exceed the user's cognition. Also, many users may have a difficult time setting up parts of the tent because of physical limitations, like height. They can use a step stool if they have one or step on different parts of the vehicle. The first step is to unzip and remove the waterproof cover from the tent. Once this is completed, the user must take the Velcro off the ladder; this allows the ladder to be accessed. Moving on, the user must extend the ladder to its full length, and they will know the point is met when the ladder no longer clicks when pulled. These clicks are instant auditory feedback letting the user know the ladder is locked. Once the ladder reaches its full length, the user must pull down on it to begin opening the tent. The user must continue the pulling task until the tent lays out flat. If these steps do not occur in this order, the rest of the set-up cannot occur. The ladder should now be adjusted to make a 60^{o} angle with the ground. The latches of each rung on the ladder will need to be locked into place, starting from the top, until 60^{o} is met. This angle is recommended for safety reasons and is written on the ladder itself. The risk/benefit tradeoff comes into play if the user chooses not to follow the recommendation. If this occurs, the ladder

may not be safe, but it can still perform its function. The last two steps to complete are accessory based and do not need to be completed to use the tent, however, are considered part of the set-up. The first one is the attachment of the annex. The annex can be used as a small room at the base of the tent. The user must attach it via a zipper at the base of the tent. Once all four sides of the tent are zipped, it is fully functional. Its function decreases as the number of sides zipped in decreases. Finally, the windows can be opened using the four widow poles provided; they must be inserted into the designated holes in the tent base and hooked onto the bottom corners of both windows. Once all four of the subtasks are completed, the tent is finished and can now be used. Image 3 below shows the finished product.

(Image 3)

Hierarchical Diagram- Setting up a Rooftop Tent



Part 4:

The first task analysis on making chocolate chip cookies was a great way to start. First off, it was something that I know well; I was able to pick apart each subtask into smaller steps. This hierarchical task analysis has allowed me to look at making cookies in a whole new way. I would have never thought about all the safety precautions I choose to take as well as the risk/benefit tradeoff I use every time I complete the task. Personally, using an oven mitt to place the baking sheet into the oven is a step I skip. Instead, I use my bare hand and take the risk. I enjoyed getting to address the measurement aspects of baking; using the speed-accuracy tradeoff to express the importance of accurate measuring has helped me solidify its meaning. The second task analysis on setting up a rooftop tent showed me how in-depth a HTA can be. When explaining how to set one up, you can use simple subtasks, however, when it comes to a HTA, simple subtasks will not give the full picture. I had to be detailed when breaking down the subtasks because if one step is missed, then the task may not make sense.

The main thing I learned from completing this hierarchical task analysis is how descriptive they can be. It all depended on how specific I wanted to get and how far I broke down each step. I broke every subtask down to the most specific thing I could think of to cover all parts of each task. I attempted to complete the diagrams for each task based on memory at first. Once I started to write down everything in more detail for the summaries, I realized how much I missed. It helped me by physically moving step-by-step through each task to accurately build my diagrams.

Most tasks, like the two I chose, can be completed differently; however, they all aim to produce the same results. Look at making chocolate chip cookies, for example. If the user does not have a KitchenAid mixer, they are still able to make chocolate chip cookies if they have a hand mixer. Either way, the cookies will end up tasting the same. In the rooftop tent analysis, the user can level the vehicle in different ways; they can either use an app on their smartphone or "eyeball" it. There are very few tasks that can only be completed one way and the HTA is great at showing this. After completing these HTAs, I realize how difficult something I consider simple can be.

In conclusion, hierarchical task analyses are a beneficial tool because they can be completed quickly yet also efficient in terms of detail. This is a great tool to use for many different tasks that do not fall into a similar category as well. Chocolate chip cookies and a rooftop tent are far from similar, but I was able to perform an extremely detailed HTA on both. Although I have expressed all my likes for this analysis, I did learn about a couple of downsides to using it. Using this method made it difficult for me to address if any changes needed to be made to the steps of each task. I feel as if this would be easier if I was analyzing a task I was not as familiar with. Since I have completed both tasks multiple times, it was difficult to think about other ways the tasks can be completed as well.