‘Design Your Life’ high-fidelity prototype – The Design Journey

Background

Design Your Life is a research project (2020 – 2024) aimed at developing a creative, hands-on toolkit to empower young autistic adults. The toolkit is designed to help them create, adapt, and enhance their own supportive technological environments, promoting independence and autonomy in daily life.

As the project entered its final stages, Jelle van Dijk and Niels van Huizen collaborated with the DesignLab DreamTeam. Their mission was to create a high-fidelity version of the **Design Your Life (DYL) Toolkit** - one that could be showcased and actively used. Recognizing the value and relevance of the project, the DesignLab team eagerly joined in on this design sprint.

In about six weeks, we successfully redesigned both the physical toolkit and its accompanying graphic materials. By the end, we had produced two high-fidelity toolkit sets that met our original goals and built upon the project's earlier work.

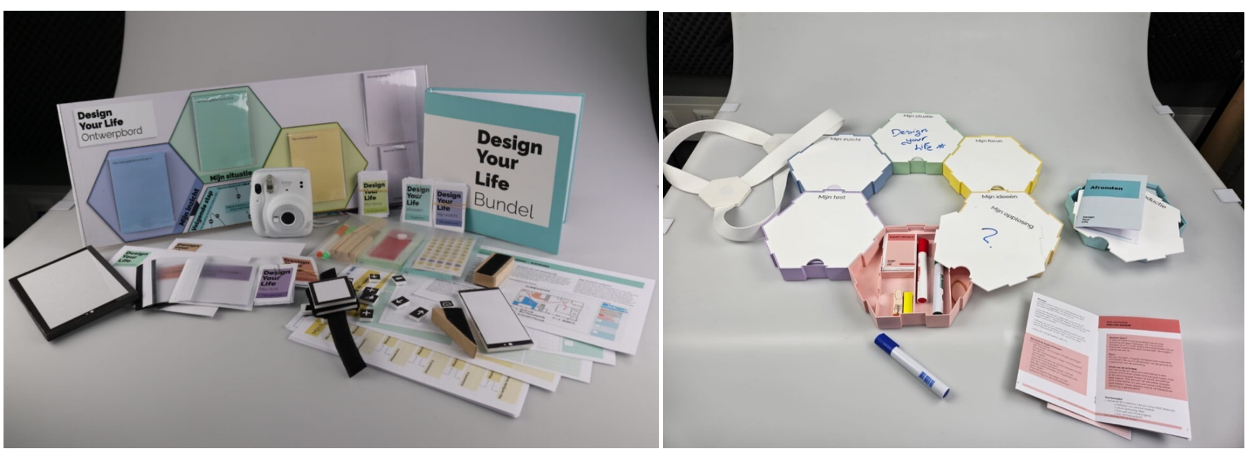


Figure 1: The example toolkit that the design was based on (left), the final hi-fi prototype (right)

The Design Journey

Project Team

The project team was a diverse group of DreamTeam members, each bringing different academic and professional expertise. The team was assembled and coordinated by Alexandru-Lucian Amariei. Decisions were made collaboratively with ongoing feedback from Niels van Huizen.

While tasks were shared and interchangeable, the team's roles could generally be divided into two areas:

- **Design & realization of the physical toolkit:** Arjen van Assem (Industrial Design Engineering) & Marcos Montero Grande (Industrial Design Engineering)
- **Graphical elements:** Cristina Ionaș (Communication Science) & Zalfa Imtinam (Creative Technology)

Defining Requirements

The initial requirements, discussed with Jelle van Dijk and Niels van Huizen, were straightforward: the redesigned toolkit needed to be visually appealing, functional, based on the research conducted so far, and easy to reproduce. We intentionally kept these initial requirements broad to allow for flexibility and refinement as the project progressed.

Through continuous collaboration with those who commissioned the project, we were able to iterate on these requirements. They evolved naturally based on feedback and were ultimately shaped by the time and resources available. Below is a table summarizing the key requirements that emerged during the project:

Physical toolkit	**Graphical elements**
The object consists of 7 hexagonal, stackable boxes, all of the same size.	Workbooks and canvases fit inside the box.
Each box contains tools for one step of the process, with the introduction box having extra utility storage.	Tools within the object should be reusable.
Lids (and preferably boxes) are color-coded to match the step they represent.	The current card set contents must not be changed (one copy per different card).
Boxes can be closed and are modular, forming a large hexagon when connected, acting as a playing board.	The object includes either one large information booklet or one booklet per step.
Boxes have a whiteboard on top and should be flat enough to function as a playing surface.	The layout of booklets and cards can be modified, but colors, logos, and fonts must remain unchanged.
The object includes a carrying system, a QR code linking to a drive for downloads, and a tool for drawing.	
Emphasis on closures to foster a sense of completion.	

The physical toolkit

Starting with the initial requirements and the existing toolkit, we took an inventory of the materials and began exploring different approaches for its realization. It was important to us not to lose the essence and core elements of the original toolkit, as that would have overlooked the hard work done by the Design Your Life (DYL) team. Therefore, our first step was to experiment with different methods for creating the boxes, based on the materials they would need to contain.

Once we had the precise measurements for the toolkit's contents, we began prototyping various box designs. Using the resources available at the University of Twente's DesignLab, we tested several fabrication methods. At first, constructing the boxes from laser-cut plywood (Figure 2) appeared to be a practical solution.

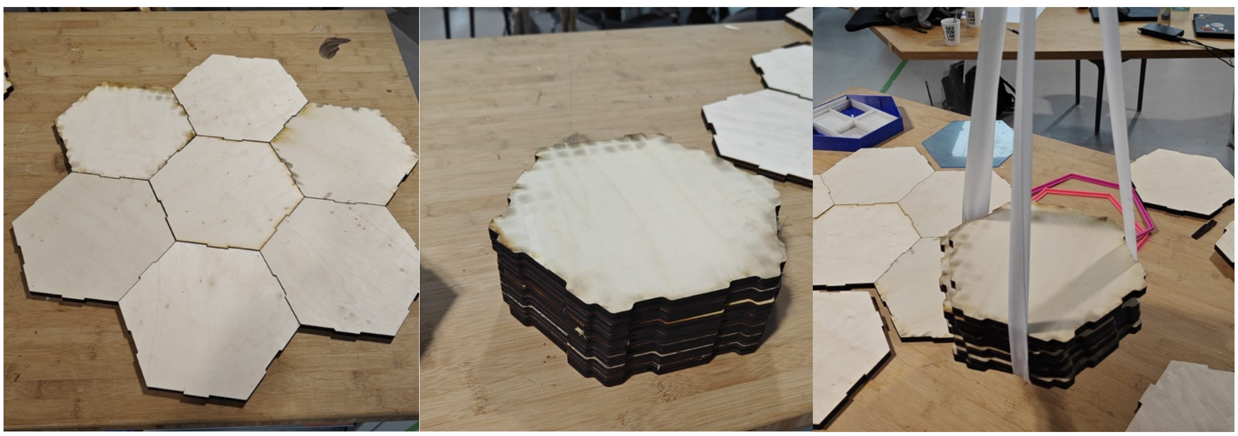


Figure 2: Plywood prototypes of the box

However, after working with wooden prototypes, we found that this method was too cumbersome to efficiently reproduce and lacked the ease we were aiming for. As a result, we switched to 3D printing. We went through several iterations of 3D models for the boxes, to arrive to a design that was stackable, economical in terms of material use, and able to fit into a honeycomb structure when laid on a table. This also creates the possibility to easily print additional boxes as add-ons for the toolkit (e.g., the Droomoplossing-kit). Figure 3 shows one of the initial prototypes alongside a more refined version.

Figure 3: 3D Models of the boxes

One challenge we encountered during the process was figuring out how to organize the materials within each box, rather than simply placing them inside and hoping they wouldn't get mixed up. To solve this, we designed custom inserts for each box, tailored to organize the materials efficiently. These inserts can be just slotted in the box, not requiring any glue. Special consideration was given to the materials critical for each step of the exercise, as well as the updated toolkit components, such as card sizes and new booklets. Figure 4 shows two examples of these box inserts.

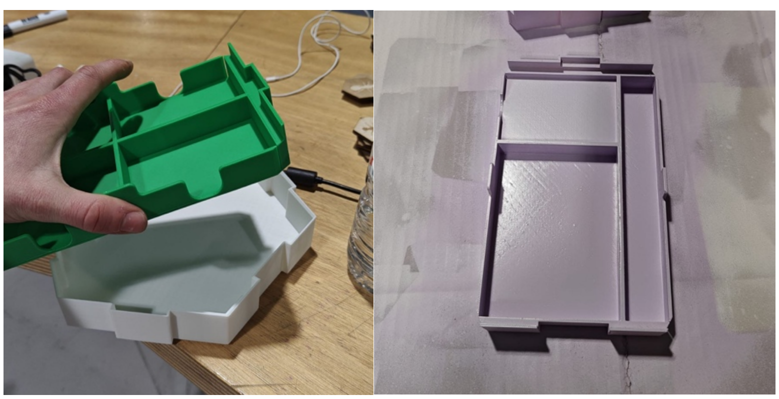


Figure 4: Box inserts

Another challenge we faced during the process was finding a way to efficiently stack and transport the final product. We wanted the boxes to fit together tightly, with minimal gaps, and ensure the toolkit could be moved easily. The solution for stacking relied on precise measurements of the boxes, edges, and lids. At this stage, our decision to use 3D printing proved highly beneficial due to its precision.

For portability, we used textile straps that were sewn together and secured with two 3D-printed hexagons: one for holding at the top and another that fit into the bottom box of the last step, ensuring the stability of the entire toolkit. The bottom box had to be redesigned as well, to ensure a good fit of the carry strap. Figure 5 shows the stacked boxes and the carry strap.

Figure 5: Stacked boxes without and with the carry strap, and the adapted bottom box model

We also explored several options for designing the box lids. Initially, we tried using wood covered with plastic foil and transparent Plexiglas, but both methods were found to be too cumbersome. Ultimately, the best solution was to laser-cut white opaque acrylic. This provided a simple and effective way to open and close each box, while also allowing for easy writing and erasing when using a whiteboard marker. Furthermore, each lid was engraved with the name of the respective phase, and then the engraving was painted using a black marker. Figure 6 shows both an early transparent version of the lid and the final design.

Figure 6: Transparent lid prototype and the final lids

At this stage, we moved on to assembly. After 3D printing the boxes (using PLA, as a more sustainable alternative) and strap supports, and laser-cutting the lids, we used spray paints that closely matched the colors of the phases in the original toolkit. Once the painting was complete, we assembled all the components, and the toolkits were finalized.

Figure 7: The boxes and inserts before and after assembly

Graphical elements

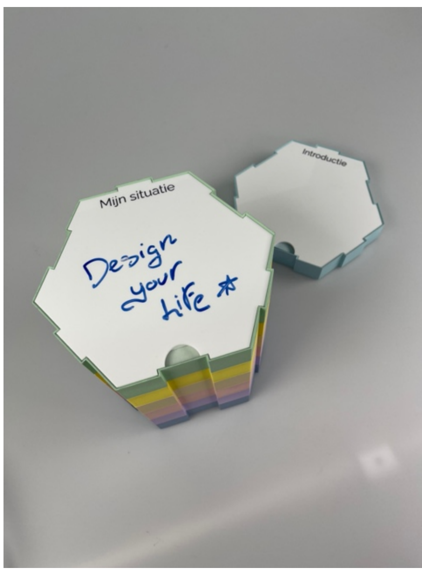
We will briefly highlight some of the changes made to the graphical elements. However, this does not imply that this step was any less important than creating the physical toolkits. Together with Niels van Huizen, we reviewed the materials to determine what could be retained and what could be removed. Afterward, we examined the original project documents to identify areas for improvement. The content of the text remained largely unchanged, as it was deeply rooted in the research conducted for the DYL project. Any minor changes made were carefully reviewed in advance.

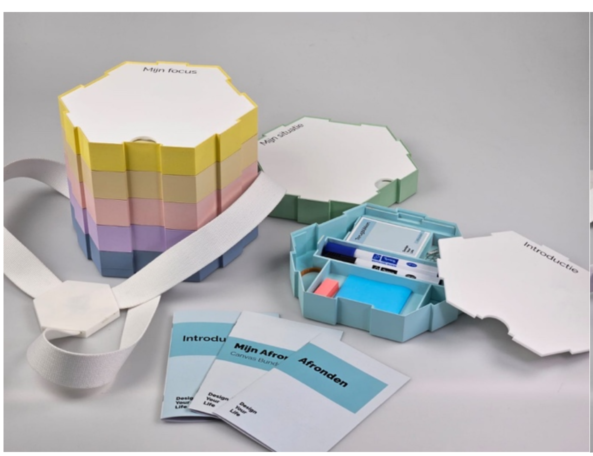
Visually, we maintained the same style from the original toolkit, including fonts, colors, and other elements. Though the changes were subtle, we believe they were impactful. Font sizes were adjusted, and the layout was reorganized to enhance readability. This applied to the cards, templates, and booklets.

One of the main challenges we faced was dividing the instruction book into separate booklets that would fit into each box, corresponding to the phase or step within the phase, they represented. We achieved this by carefully considering the measurements of all the materials and the boxes. Additionally, some templates needed to be reusable. To address this, we applied transparent plastic stickers to the parts of the paper templates that needed to be reused. We also considered laminating the templates, but ultimately opted for the plastic stickers to reduce the amount of plastic used.

The end-result

The pictures below show the end-product. In its base-state, the toolkit has seven boxes, one for each phase of the process and one for the introduction and general materials.





Build your own

Below is a brief walkthrough of the process we followed to create the high-fidelity prototype of the toolkit. This method is based on our experience, but we believe it can and should be optimized in the future. Additionally, the process is lengthy and highly dependent on the available machinery. We recommend to also do this at a maker space close to you that can provide the machinery, materials, and qualified help in the process.

Machinery:

- 3D Printer (we used a Bambu Lab X1 Series).
- Laser cutter (we used a Trotec Speedy 300 Flex).

Materials:

- PLA Filament, preferably white (we used about 2 kg, amount will depend on the settings of the 3D Printer).
- 2 sheets of 3 mm white opaque acrylic (40x60 cm).
- 3 meters of 4 cm wide canvas strap, white, cut into 3 equally sized pieces.
- One 150x100cm sheet of plastic sticker for making the templates reusable (we used Roland Truevis).
- 2 cans of clear coat matt spray (we used Molotow Premium Clear Coat Matt).
- 2 cans of spray primer that is suitable for PLA (we used Molotow Primer Styropor).
- 7 cans of spray paint, one color for each box and corresponding to each phase and the introduction (we used Molotow Premium Spray-paint, with the following color codes: 001-jasmin-yellow, 045-grapefruit-light, 064-crocus, 086-pigeon-blue-middle, 089-azure-blue-light, 137-calypso-light, 184-ivory-light).
- A4 and A5 paper.
- Post-its.
- Markers.

Realization

For the boxes:

1. Upload the 3D file of the box (*DYL_box_print.stl*) to the processing software of the 3D Printer. We used the 0.4 mm nozzle preset, with 10% infill, and no supports for all 3D printed files. Generally, the finer you go, the better the boxes will look, at the expense of more time required for printing. Using this file, you can print the six boxes of the toolkit.
2. Upload the 3D file of the base box (*DYL_basebox_print.stl*) to the processing software of the 3D Printer. Using this file, you can print the base box of the toolkit that is used for the last phase and for slotting-in the carry strap.
3. Upload the 3D file of the insert to the processing software of the 3D Printer. There is one file for each phase (*DYL_Insert_[name of the phase].stl*). You will need to print these files one-by-one.
4. Once all parts of the boxes are printed, lay each box on a sheet of cardboard outside or in a well-ventilated workshop.
5. Apply one layer of primer on each box and insert and let it dry.
6. Apply two layers of paint on each box and insert, according to the step it is a part of. Allow some time to pass between applying the second layer for the paint to properly dry.
7. Once the paint layers are applied, add one layer of clear coating on all pieces and let it dry.
8. Boxes are done!

For the lids:

1. Upload the files one by one (*DYL_lasercut_lids_60x40_[1 or 2].pdf*) to the software of the laser cutter. Make sure the settings are adequate for cutting and engraving acrylic.
2. Allow for each set of lids to be cut and engraved.
3. Use a black marker to paint the engraving spot with the name of each phase.
4. Lids are done!

For the carry strap:

1. Upload the 3D files of the support (*DYL_carry_hexagon_[top or bottom].stl*) to the processing software of the 3D Printer.

2. Stitch the three straps at one end, with the corners between them at 120 degrees. For this, the three strap ends can be stacked and taped at the right angle first, then stitched together. You might encounter difficulty depending on the strength of the sewing machine. A machine setting and needle combination for thick material is recommended.
3. Once the 3D prints of the supports are done, fix them by clicking the two parts of each support over the stitched parts of the strap. Some glue can be added if the press fit does not provide sufficient holding force.
4. Carry strap done!

For the graphical materials:

For this step, we recommend you to send the InDesign files to a printing company (e.g., Xerox) and ask them to print and cut them using the settings in each file. Once the templates are printed, you can cut pieces of the sticker and place it over the areas on the templates that need to be reusable.