MODULE	7
TITLE	**Production Line and Business Operations**
TIME (approx.)	60 – 90 minutes
OUTCOMES	**Students will:** • Discuss the benefits of a production line and the process of streamlining the production of goods • Practice and refine a production line following instruction • Create a production line for a mock business • Apply knowledge to creating an inventory and production line for their business
KEYWORDS	INVENTORY; PRODUCTION LINE
VIDEO	**MODULE | 7 – Production Line and Operations** **Presented by: Simply Raw**
ADDITIONAL RESOURCES	• Video • Post it notes • Pre-prepared widget using coloured paper (see Educator notes). • Items for Production line competition: 1x scissors per team; 1x stapler per team; 20x A4 sheets of paper (choose one colour); 5x A4 sheets of paper (choose a different colour) • **Worksheet:** T-Shirt Production line; and Product Production Line Inventory.

KIDPRENEUR ACTIVITY	**EDUCATOR NOTES**
WATCH VIDEO **MOD 7 – PRODUCTION LINE AND OPERATIONS** **Presented by: Simply Raw**	**DISCUSSION NOTES** Many products are manufactured and assembled on a production line. Before the introduction of computer control and robots, production lines were operated by people. Each person would carry out a limited number of tasks or even just one task and the product would then be passed down the production line to the next person. This would continue until the product was completely assembled. Some modern production lines still operate in the same way whilst others rely on robots and computer control or a combination of people and machines.
1. WHAT IS A PRODUCTION LINE? **THINK, PAIR, SHARE ACTIVITY** **Record responses:** • What is the purpose of a production line?	**DISCUSSION NOTES** **A Production Line** is a time saving process to build many high-quality products in the most efficient way. In this module Kidpreneurs will create their own inventory list and production line to help them produce their business products quickly, efficiently and to a high quality.

Whole class group activity:

- Can you think of some items in the classroom that could be produced on a production line? (pencils, books, computers, windows, doors)
- On post-it notes write down the steps for producing an object (from above, or for posting many identical letters and getting them ready to post)
- What are the advantages of using a production line?
- When would production lines not be useful? (Artist painting a portrait, writing a letter to a special friend.)

Add this to your Kidpreneur Challenge Display.

In businesses making large volumes of products for sale, it takes far too long to make each product one-by-one from start to finish. So, businesses will often use a 'Production Line'.

To do this, the process of making a product is divided into steps. Each step is completed for all products before moving on to the next stage of production.

For example, a production line can be used to send many letters in the mail. The process of printing, folding, addressing and stamping all the letters can be broken down into steps. Each step will be completed for all letters before moving on to the next one.

These steps might be:

1. Fold all letters into thirds ready to go into the envelope. Put all letters into a pile.
2. Put all letters into their own envelope. Put all envelopes on a pile.
3. Peel off printed address labels and stick onto each envelope. Put all addressed envelopes into a pile.
4. Put a stamp on each envelope. Put all stamped envelopes into a pile ready for posting.

Advantages of a production line:

1. **Quicker - The overall time to make all the products is reduced**
   This is because you can get quick at doing the same repeated task with little wasted time in between as you get into a flow. E.g. if you folded, enveloped, addressed and stamped each letter one at a time it would take longer as you wouldn't get into a flow and it takes time between each step.
2. **More quality - The quality of each product is higher**
   This is because if you are doing the same step for all items you pay special attention to every step and get better at that step the more times you do it. E.g. if you put the address label on one after the other you get better and better at putting it on straight and in the right place.
3. **More specialisation - You can get other people who are good at specific things to complete certain parts of the process.**
   This means that you could have different specialist people working on different parts of the process at once to save time and have higher quality. E.g. One person who is good at folding can fold all the letters and the next person takes letters off the folded pile and puts them into an envelope, then another person takes the envelope and sticks the address label on it and so on.

2. THE PRODUCTION LINE COMPETITION

INTERACTIVE ACTIVITY

The Production Line Competition

Play the production line competition following these instructions.

ACTIVITY NOTES

The Production Line Competition

The aim of this activity is to show Kidpreneurs how much more efficient a production line is compared to making individual products one by one (see the 3 advantages listed above).

Preparation: Prepare an example the widget - a pile of 9 triangles of consistent size with one triangle of a different colour in the middle and a staple through the middle of the stack of triangles.

You will need the following production line resources:

- 1x scissors per team
- 1x stapler per team
- 20x A4 sheets of paper (choose one colour)
- 5x A4 sheets of paper (choose a different colour)

How it works:

1. In teams of 3 or 4 view the prototype of a widget. You have 2 minutes to build as many widgets as you can (NOTE: only widgets that pass the Educator quality control will count as finished products.)

2. How many widgets did your team make? Nominate one person to be a judge to check other team's widgets.

3. Judges are to check quality i.e. triangles of different sizes, the different colour isn't in the middle of the 4-1-4 stack, there are too many triangles etc.

4. What did you do well or how could things be improved?

5. Redo the exercise with 5 minutes to plan their production line.

6. Compare both the quantity and quality of the widgets.

Here's how to run the production line competition:

You will need the following production line resources:

- 1x scissors per group
- 1x stapler per group
- 20x A4 sheets of paper (choose one colour)
- 5x A4 sheets of paper (choose a different colour)

How it works:

1. Split your Kidpreneurs evenly into groups of 3-4, giving each group one set of production line resources
2. Show them a pre-prepared prototype of the widget they must make (a pile of 9 triangles of consistent size (they choose the size) with one triangle of a different colour in the middle and a staple through the middle of the stack of triangles.
3. Teams have 2 minutes to build as many widgets as they can, though only widgets that pass the Educator quality control will count as finished products.
4. At the end of the time, teams state how many they made. Each team nominates an adjudicator to check the other teams' quality to find ones which aren't adequate quality i.e. triangles of different sizes, the different colour isn't in the middle of the 4-1-4 stack, there are too many triangles etc.
5. Ask the teams to share what they did well and what they could do differently.
6. Now instruct them to redo the exercise first having 5 minutes to plan their production line. See how many more they can make in the same period (2 minutes). An example of a production line process might be: Team member 1: draws triangle outline. Team member 2= triangle cutter. Team member 3= Triangle stacker. Team member 4= Triangle stapler.

Compare both the quantity and quality of widgets made in each round. Use the results to discuss the benefits of a production line. If the production line did not improve quantity or quality, discuss how it could have been done differently to achieve increased quality and quantity.

3. DESIGNING A PRODUCTION LINE FOR BUSINESS THAT MAKES SPRAY PAINTED T-SHIRTS

This can be done individually using the worksheet provided or as a class group.

KIDPRENEUR WORKSHEET ACTIVITY

Our Production Line

ACTIVITY NOTES

Now Kidpreneurs can practice designing a production line with an example business.

The Module 7 Worksheet contains an Inventory of the materials available for a business that makes spray painted T-shirt designs. Also listed is the equipment available for use in the production line process.

The Worksheet gives a blank template for Kidpreneurs to design a production line for this business. The steps to completing the production line are as follows:

- List the main steps in producing each item. Describe each step in the first column of the table labelled 'Step'.

- Identify the raw materials required for each step and record this in the 'Raw Materials' column of the table. (Remember the distinction between raw materials and equipment.
- Name the equipment required for each step and record this in the 'Equipment column of the table.
- Finally, think of a tip for each step to help make the production line more quick, better quality or use specialized skills.

See possible answers in *Tips and Supplementary Educator resources*

4. WHAT WILL YOU NEED FOR YOUR PRODUCTION LINE?

KIDPRENEUR WORKSHEET ACTIVITY

Raw Materials Inventory

Create an inventory of what you need:

- List the raw materials your group requires to produce your product. Include the number of items or volume required.
- List the equipment you will need.
- Where will you get the items on your inventory? (purchase, borrow, reuse)

An inventory list for a cupcake business might look like this:

Flour	5kg
Eggs	20
Sugar	6kg
Patty Pans	100
Sprinkles	500g

DISCUSSION NOTES

Raw Materials vs Equipment

There is an important distinction to make when talking about production lines. That is the difference between raw materials and equipment. Both are used within a production line but have different purposes.

Raw Materials

Raw Materials are the basic materials which are combined to make up the final product. Raw materials are used up in the production line.

E.g. For a cupcake business the raw materials are flour, eggs, sugar, patty pans, sprinkles etc.

Equipment

Items of Equipment are the tools that are used to convert the raw materials into the final product. Equipment is not used up in the production line and is used to make many products.

E.g. for a cupcake business the equipment would be bowls, mixing spoons, cupcake trays etc.

It is important to consider both what raw materials and what equipment are needed in a production line.

Inventory

To know how many raw materials are available to make products in a production line, a business will have an 'Inventory'.

An Inventory is a complete list of all the raw materials available to make a product. An Inventory is made up of the names of raw material items that the business has on hand to make products with, accompanied with the quantity they have available.

TIPS AND SUPPLEMENTARY EDUCATOR RESOURCES

Suggested answers for designing a production line for business that makes spray painted t-shirts:

	STEP **Description of each step to make the product**	**RAW MATERIALS** **Materials needed for this step**	**EQUIPMENT** **Tools I will need for this step**	**PROCESS TIP** **How to make high quality products**
1	Cut the T-shirt material to size	White T-shirt material	Scissors	Ask my friend who cuts straight lines quickly to do this step.
2	Sew the material into T-shirts	White T-shirt material + Cotton	Sewing machine	Make sure the seams are sewn in a straight line.
3	Spray paint the logo onto T-shirts	White T-shirts (sewn in step 2)	Stencil	Hold the spray can 30cm away from the stencil for the best spray
4	Spray the finishing spray to waterproof the design	Clear gloss finishing spray		Spray in horizontal lines back and forth to make sure no part is missed.

The link below, takes you to a five-minute video showing how the Tesla Model S is manufactured.

https://www.youtube.com/watch?v=8_lfxPI5ObM.