

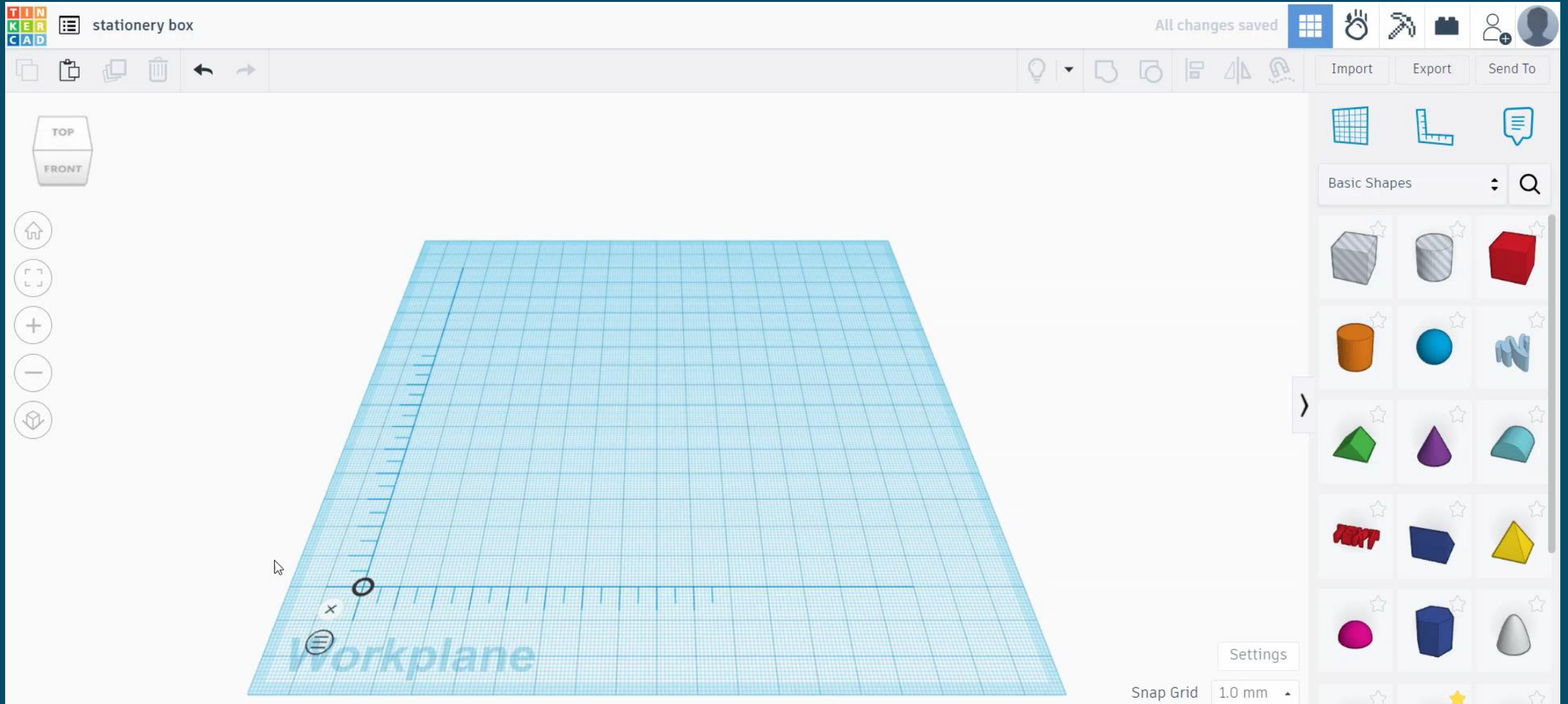
Application of the Commonly Used Tools and Equipment in STEAM Learning Activities

STEAM 學習活動中常用工具和設備的應用

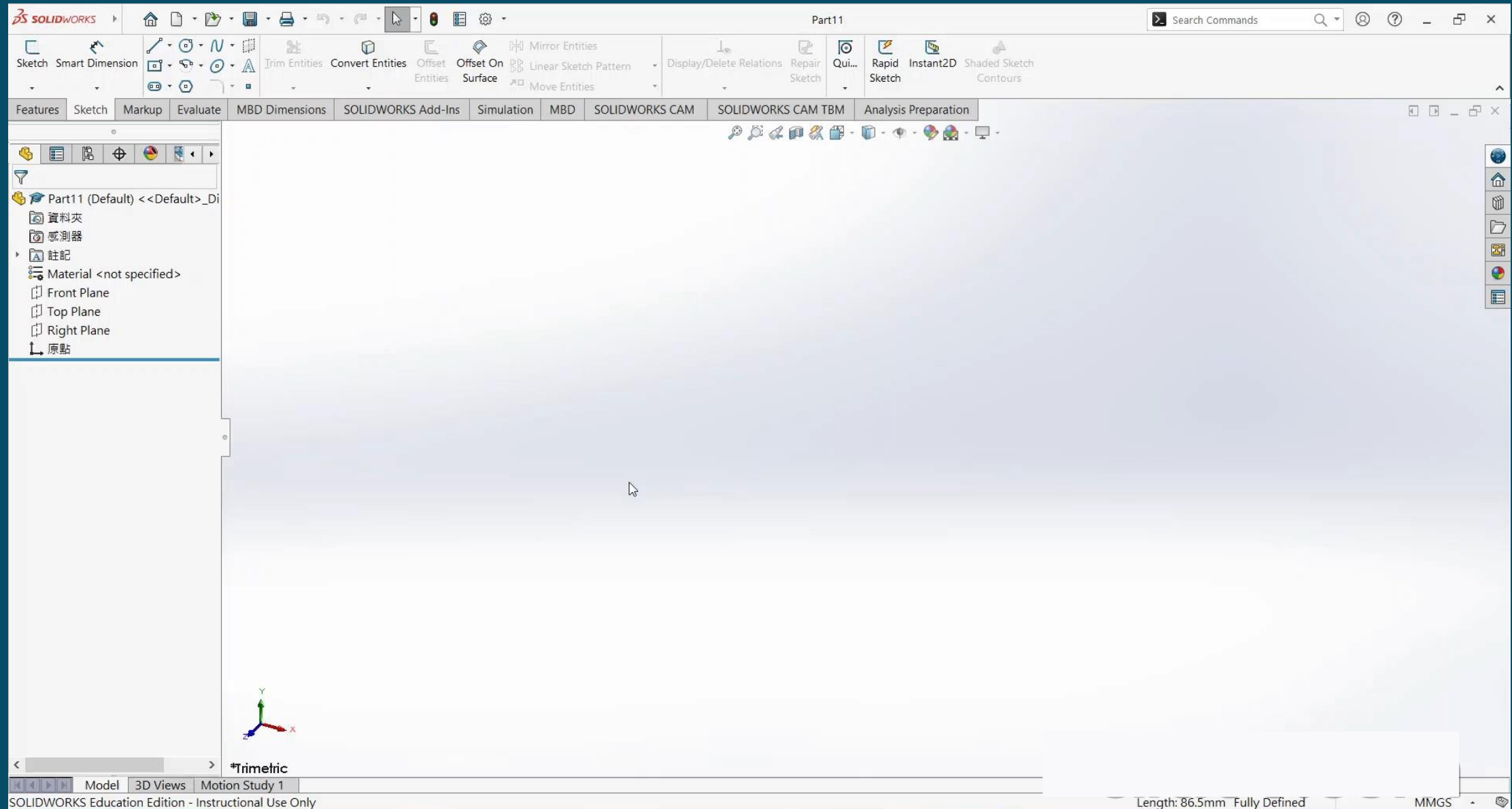
Time 時間	Content/Activity 內容/活動	Speaker 講者
15:15 – 16:45	<p>Hands - on practice: Making a stationery box by using following equipment</p> <ul style="list-style-type: none">a. Laser cuttersb. 3D printerc. Laser engravers <p>動手實踐：使用以下設備製作文具盒</p> <ul style="list-style-type: none">a. 鐳射切割機b. 3D 打印機c. 鐳射雕刻機	<p>Project Manager / Project Officer of STEM Education Centre</p> <p>STEM 教育中心項目經理/項目主任</p>
16:30 – 16:45	Q&A 問與答	All speakers 所有講者

設計軟件的選擇

例子1:利用TinkerCad設計軟件繪圖



例子2:利用Solidworks設計軟件繪圖



選擇不同打印技術的 3D打印機

根據美國材料試驗學會ASTM(2015)的標準，將積層製造的技術分為七大類型。

- 材料擠製成型：FDM、FFF
- 光固化技術：SLA、DLP
- 粉體熔融成型技術：SLS、SLM
- 黏著劑噴膠成型：Binder Jetting
- 材料噴塗成型：Material Jetting
- 疊層製造成型：LOM
- 指向性能量沉積技術：LENS、EBM

資料來源: <https://mag.addmaker.tw/2020/12/28/7-3d-print-technology/>

快速了解

3D、列印 *A*

打印技術比較

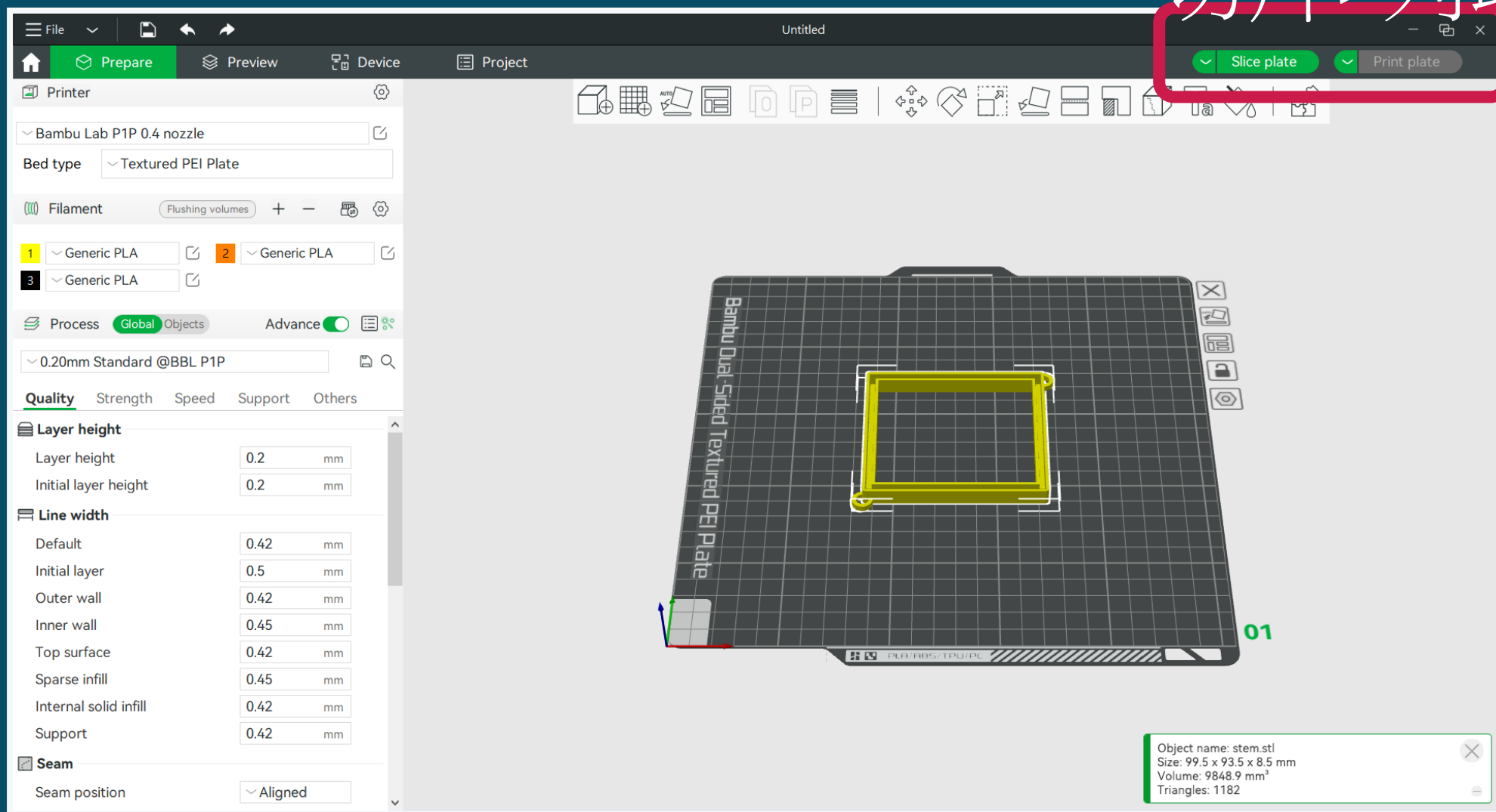
技術	材料擠製成型	光固化成型	粉體熔融成型
技術	FDM (Fused Deposition Modeling)	SLA (Stereolithography) DLP (Digital Light Processing)	SLS (Selective Laser Sintering) SLM(Selective Laser Melting)
材料	PLA, ABS,食物...	液態的光固化樹脂	塑膠,金屬, 陶瓷等粉末
成品特性	堆疊紋路明顯, 細緻度較低	表面光滑細緻	成品較堅固
成品	概念模型	客製化耳機、牙科模型	機械結構

FDM打印機切片軟件

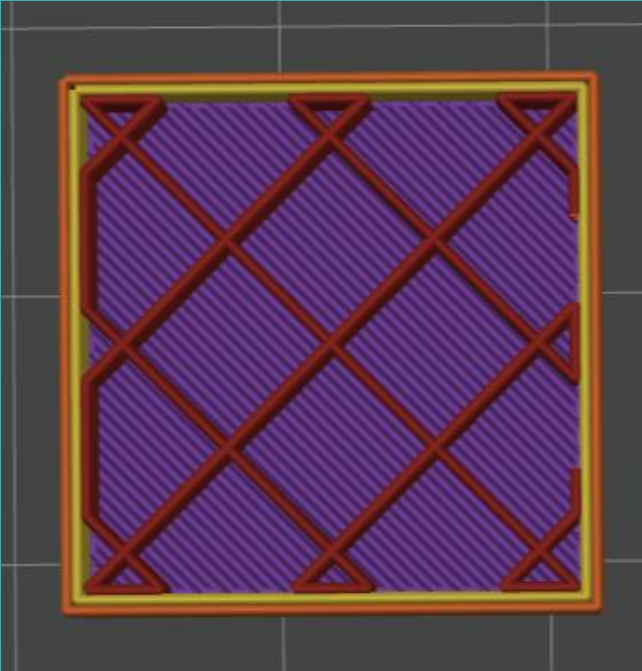
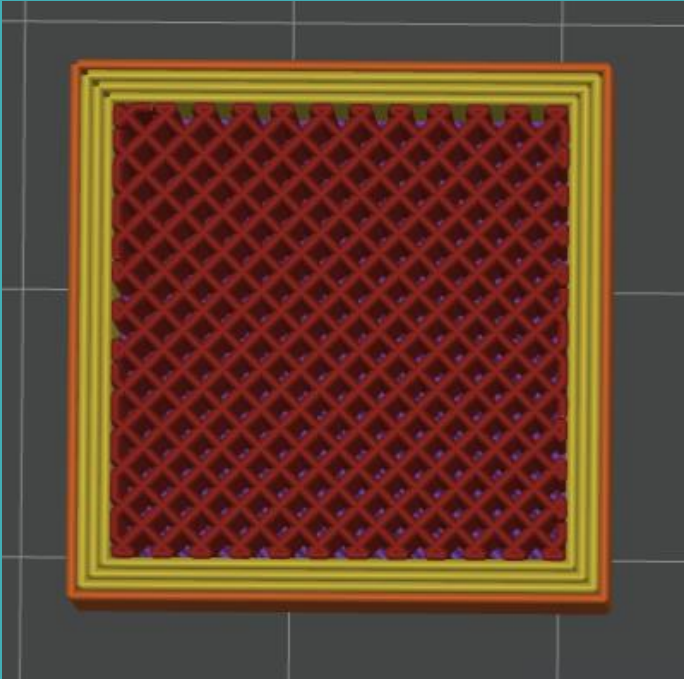
打印設置

切片軟件(FDM打印)

切片>列印



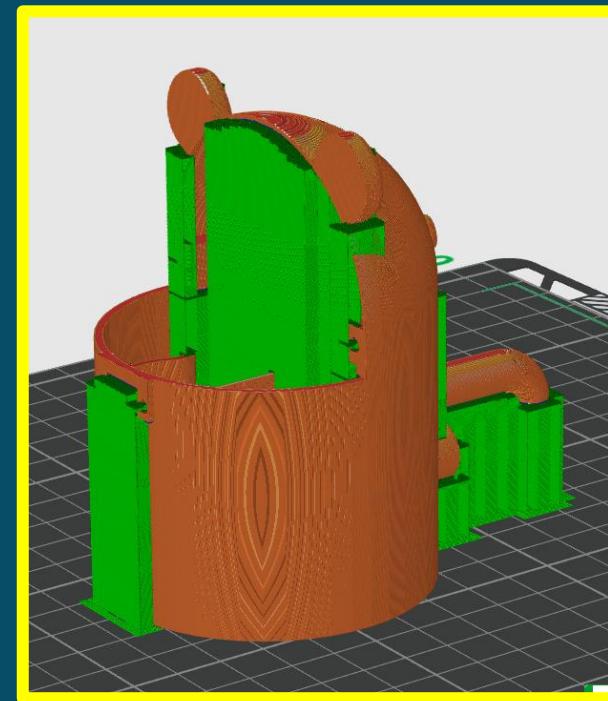
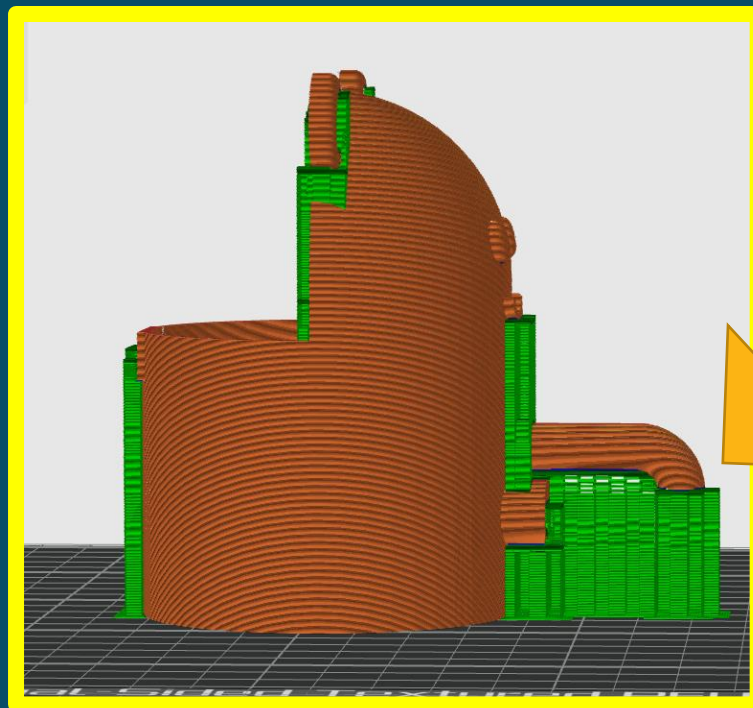
牆厚及填充密度

		
Wall	2	4
Infill	15%	80%

支撐(Support)



自動消毒潔手裝置



支撐(Support)

Printer

Bambu Lab P1P 0.4 nozzle

Bed type: Textured PEI Plate

Filament

Flushing volumes: + -

1 Generic PLA 2 Generic PLA 3 Generic PLA

Process Global Objects Advance

* 0.20mm Standard @BBL P1P

Quality Strength Speed **Support** Others

Support

Enable support ☒

Type: normal(auto)

Style: Default

Threshold angle: 30°

On build plate only ☒

Support critical regions only ☐

Raft

Raft layers: 0 layers

Support filament

Support/raft base: Default

Support/raft interface: Default

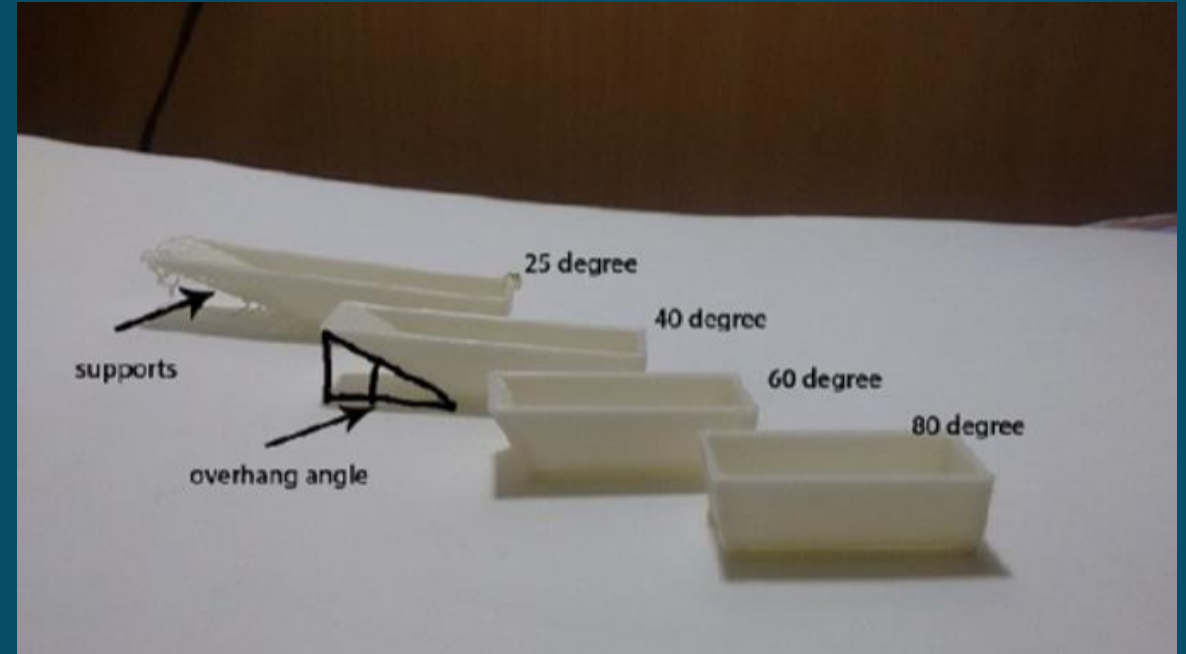
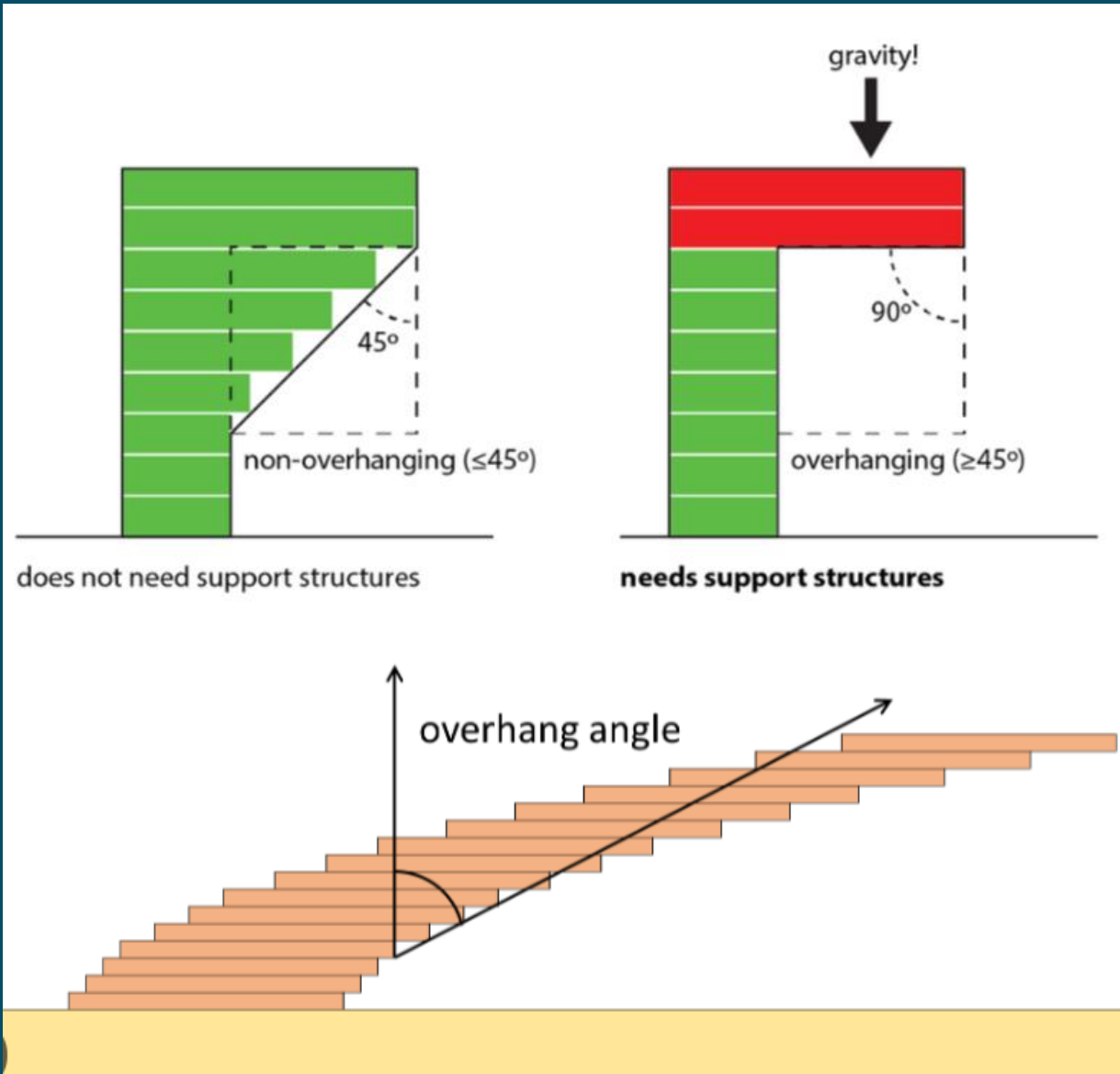
Advanced

Top Z distance: 0.2 mm

Line Type	Time	Percent	Display
Inner wall	26m44s	18.4%	<input checked="" type="checkbox"/>
Outer wall	36m11s	25.0%	<input checked="" type="checkbox"/>
Overhang wall	39s	0.5%	<input checked="" type="checkbox"/>
Sparse infill	6m26s	4.4%	<input checked="" type="checkbox"/>
Internal solid infill	8m27s	5.8%	<input checked="" type="checkbox"/>
Top surface	3m1s	2.1%	<input checked="" type="checkbox"/>
Bridge	7m0s	4.8%	<input checked="" type="checkbox"/>

Configuration can update now. [Detail](#)

支撐角度(Overhang angle)



列印平台附著類型(Bed adhesion)

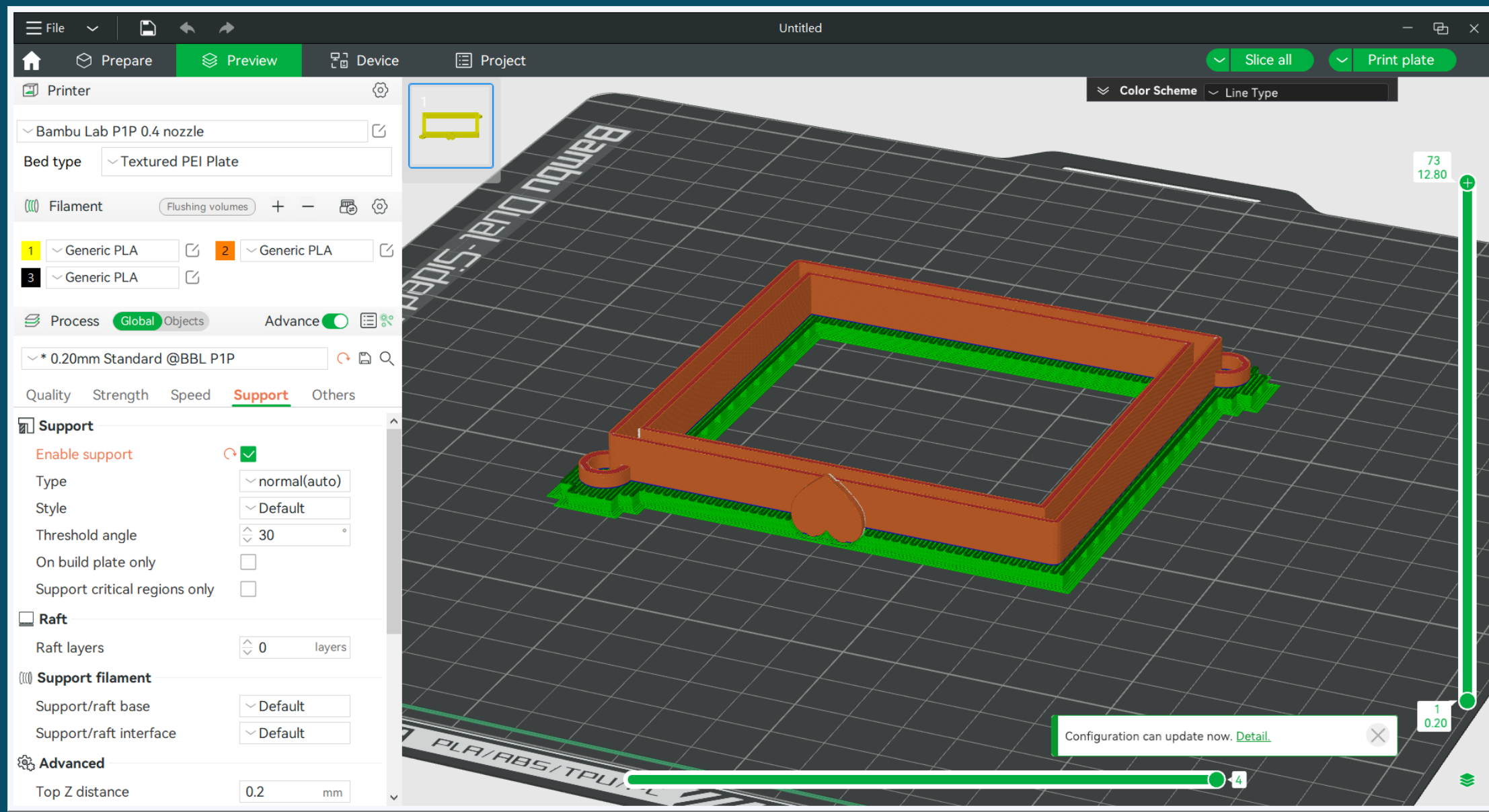
The screenshot displays the Bambu Studio software interface. The main 3D view shows a brown, bowl-shaped object with a handle, positioned on a blue circular base (the printer bed) which is surrounded by green support structures. A red arrow points to the base. The interface includes a top menu bar with 'File', 'Prepare', 'Preview', 'Device', and 'Project'. Below this is a toolbar with 'Printer', 'Filament', 'Process', and 'Advance' tabs. The 'Printer' tab is active, showing settings for 'Bambu Lab P1P 0.4 nozzle' and 'Textured PEI Plate'. The 'Filament' tab shows three generic PLA filaments. The 'Process' tab shows a 0.20mm standard nozzle. The 'Advance' tab is also visible. On the right, a 'Color Scheme' panel lists various line types and their corresponding times and percentages. A 'Total Estimation' panel at the bottom right provides summary statistics. A notification bar at the bottom indicates 'Configuration can update now. Detail.' and 'Slice ok.'

Line Type	Time	Percent	Display
Inner wall	26m44s	18.1%	✓
Outer wall	36m11s	24.5%	✓
Overhang wall	39s	0.4%	✓
Sparse infill	6m26s	4.4%	✓
Internal solid infill	8m27s	5.7%	✓
Top surface	3m1s	2.0%	✓
Bridge	7m0s	4.7%	✓
Gap infill	11m6s	7.5%	✓
Brim	1m44s	1.2%	✓
Support	22m1s	14.9%	✓
Support interface	2m20s	1.6%	✓
Custom	6m5s	4.1%	✓
Travel	15m59s	10.8%	✓
Retract			✓
Unretract			✓
Wipe			✓
Seams			✓

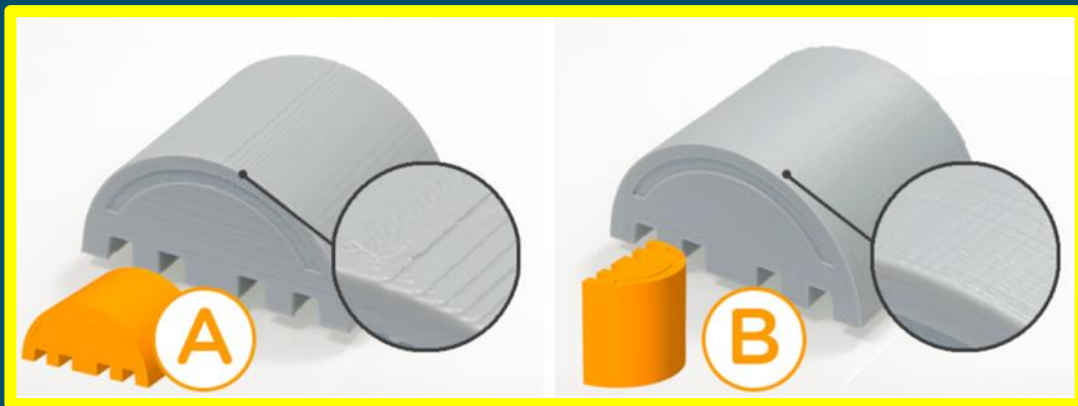
Total Estimation		
Filament:	22.99 m	68.56 g
Cost:	1.37	
Prepare time:	5m49s	
Model printing time:	2h22m	
Total time:	2h28m	

打印設置的其他考慮

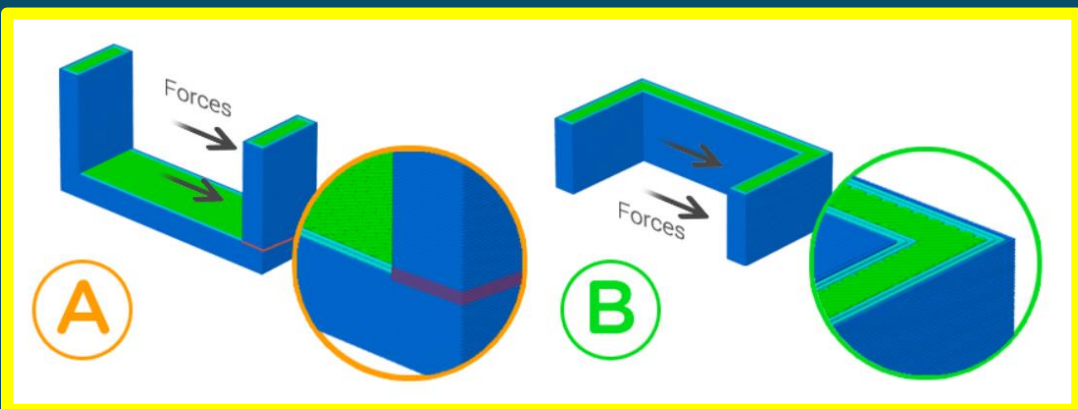
減少支撐



擺放角度



平滑面



強度