

Topic: State of Australia's Early Childhood Workforce: Is it in Crisis?

Name: Ha Ngo

Email: nvh1211@gmail.com

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1 Introduction

1.1 Background and Motivation

The early childhood sector is a critical component of the educational framework, nurturing the youngest members of society during their most formative years. Despite its significance, this sector faces persistent challenges including inadequate compensation, recognition deficits, and limited career advancement opportunities. These issues not only undermine the quality of childhood education but also threaten the sustainability of the workforce (Cumming et al., 2015). As someone deeply interested in educational policies and their societal impacts, I am motivated to delve into this crisis to foster a broader understanding and stimulate actionable insights through visual analytics. The target users of this visualisation include policymakers, educational administrators, and advocacy groups who are directly involved in shaping and improving the conditions of early childhood education. They would utilize these visualisations to evaluate current problems, plan resource allocation, and advocate for necessary reforms.

1.2 Project Objectives

The primary aim of this visualisation project is to elucidate the multifaceted challenges facing Australia's early childhood workforce. Specifically, the project will address the following questions:

- To what extent does Australia ECEC Workforce supply meet its demand?
- Effects of insufficient recognition and underpaid on the early childhood education workforce in Australia?
- Does the level of qualification impact the early childhood workforce?

By answering these questions, the visualisation seeks to provide a clear and impactful narrative that can aid in decision-making and strategy formulation for improving workforce conditions. The ultimate benefit of this visualisation will be to contribute to a more stable and supported early childhood education sector, thereby positively affecting educators and young learners alike.

1.3 Project Schedule

- Week 4 (19/8 - 25/8): Project Proposal.
- Week 5 (26/8 - 01/9): Initial data gathering from provided sources. Setting up data processing workflows. Data cleaning and preliminary analysis. Development of initial visualisation sketches.

- Week 6 (02/9 - 08/9): Visualization Critique.
- Week 7, 8 (3/9- 16/9): User feedback on initial designs. Iteration on visualisation based on feedback. Development of interactive elements and integration of additional data sources.
- Week 9 (17/9 - 23/9): Preparation for Project Report.
- Week 10 (24/9 - 30/9): Preparation for Project Report.
- Week 11 (24/9 - 30/9): Preparation for Project Report.
- Week 12 (24/9 - 30/9): Project Report.

2. Data

2.1 Data Source

The primary data sources for this visualisation project are selected based on their relevance and comprehensiveness in providing insights into the early childhood workforce in Australia. Below are the main sources:

1. **Australian Early Childhood National Registers:** The datasets include information about **registered providers, staff experience in children's education and care** and is available at the [ACECQA website](#). The data set is mainly tabular, containing attributes such as provider names, locations, service types, and accreditation statuses, which are categorical and some ordinal data like accreditation levels.
2. **Preschool Education in Australia (2022):** Published by the **Australian Bureau of Statistics**, these datasets provide annual data on preschool education. These are also tabular datasets, with attributes including enrolment numbers, staff qualifications, and hours of service—mostly ratio/quantitative data.
3. **National Centre for Vocational Education Research:** The website provides detailed tabular data on enrolments, completions on the vocational education training. The data types are primarily quantitative but include categorical data for region and service type.

Data not included in the visualisation will be any personal identifiers or sensitive information that does not directly contribute to the analysis of workforce conditions, such as specific names or contact details of educators or providers, due to privacy concerns.

2.2 Data Processing

Ridzuan et al. (2019) states that, preparing data for analysis crucially involves data purification. This process entails ensuring that data meets the quality standards of validity, uniformity, accuracy, consistency, and completeness.

Data Clean-Up: Significant data clean-up has been done, including handling missing values, standardizing formats across different datasets, and resolving discrepancies in terminologies and metrics used across different years and sources.

Data Derivation:

- Full-Time Equivalency (FTE): From part-time and sessional work hours, calculate the FTE of staff to understand the actual workforce capacity relative to the needs.
- Staff Turnover Rates: By analysing year-to-year changes in staff numbers and qualifications where available, to gauge the stability of the workforce.
- Demand vs. Supply Ratio: Calculating the ratio of enrolled children to available teaching staff to identify potential understaffing issues.

Implementation:

- Data processing implemented using Python, particularly using libraries such as pandas for data manipulation and NumPy for numerical calculations. Initial cleaning and processing will occur to form a clean, unified data frame from all sources.
- Scripts will be written to automate the calculation of derived variables and ensure reproducibility and accuracy in the processing steps.

The processed and cleaned data will then be used to develop interactive visualizations focusing on the critical areas identified, using Tableau to effectively communicate the findings and insights.

3 Requirements

3.1 Must-Have Features

Feature	Description
Number of Children Enrolled	Understanding the number and scope of early childhood education providers is critical
Hourly Fees	The cost structure for parents is represented, providing

	insight into affordability
Services	Identifies the distinct sorts of services provided by providers, allowing for difference
Number of Student Enrolled	Get the understanding in ECEC supply
Year	Understanding the trends over the periods of time
State	Get understanding in geographical distribution

3.2 Optional Features

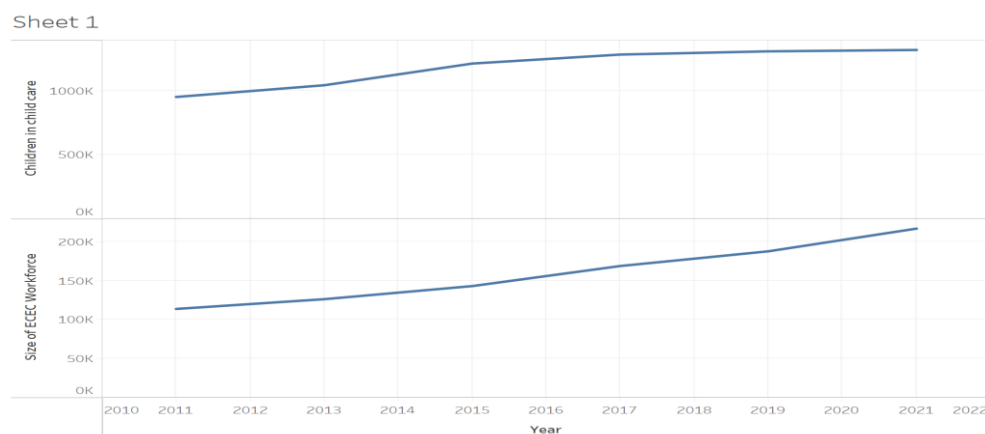
Feature	Description
Age	This section contains information on the age groups or ranges served by early childhood education providers.
Limited Hours Care/Occasional Care	Indicates whether the provider provides flexible, part-time, or occasional care.
Family Daycare	Determines whether or not family creche services are available, which may be a preferable option for some families.
Service Providers	Include precise information about the organizations or entities that provide early childhood education services

4 Visualisation Design

4.1 Australia ECEC Workforce Supply and Demand

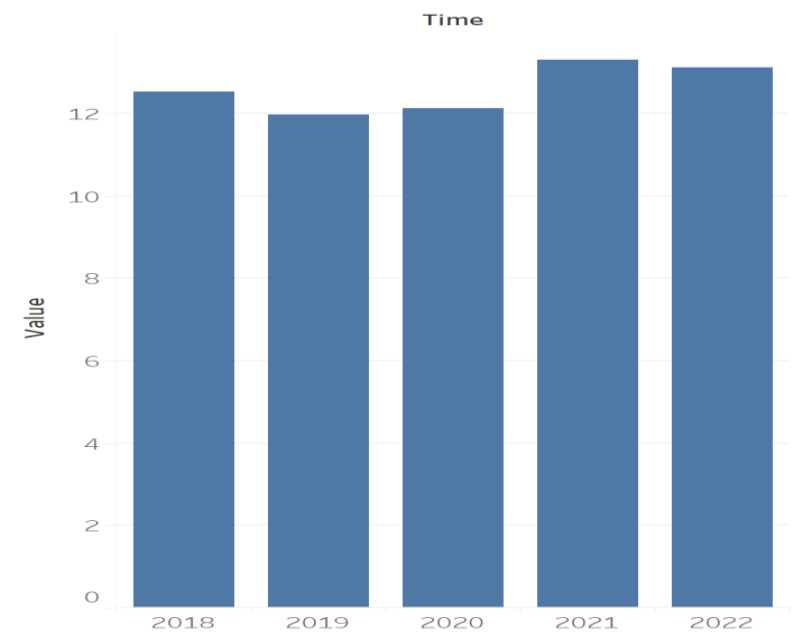
Sketches:

Sketch using Line chart to visualize the number of ECEC workforce and children in childcare:

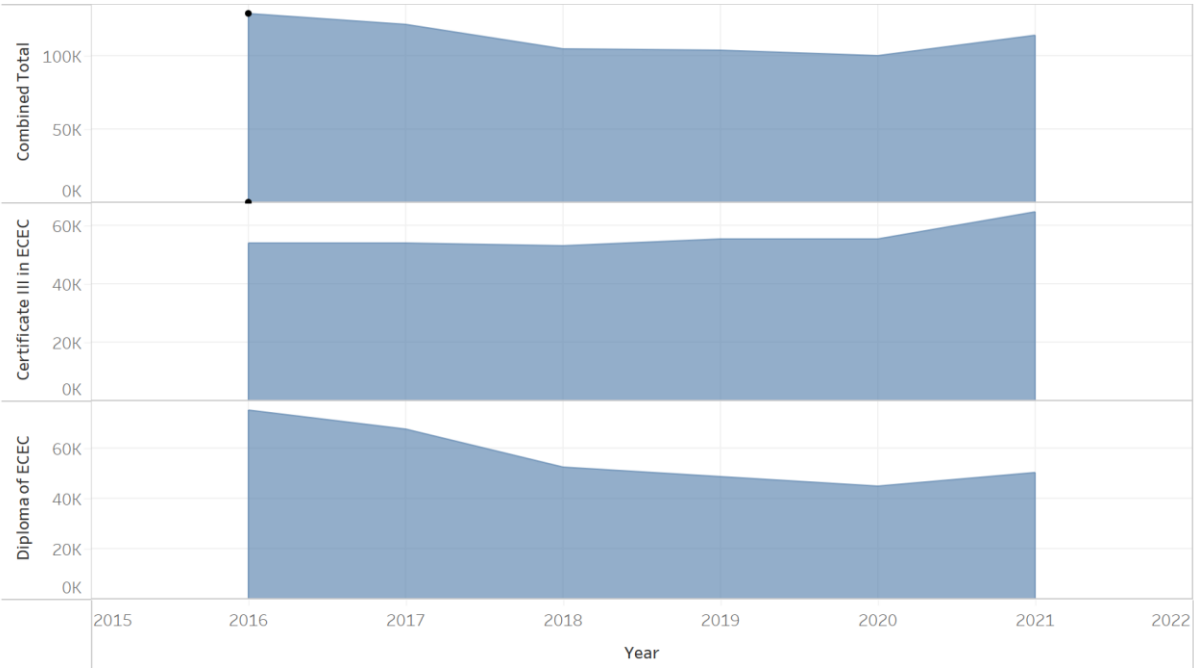


Sketch using Bar chart for displaying the student per teacher ratio:

Sheet 2



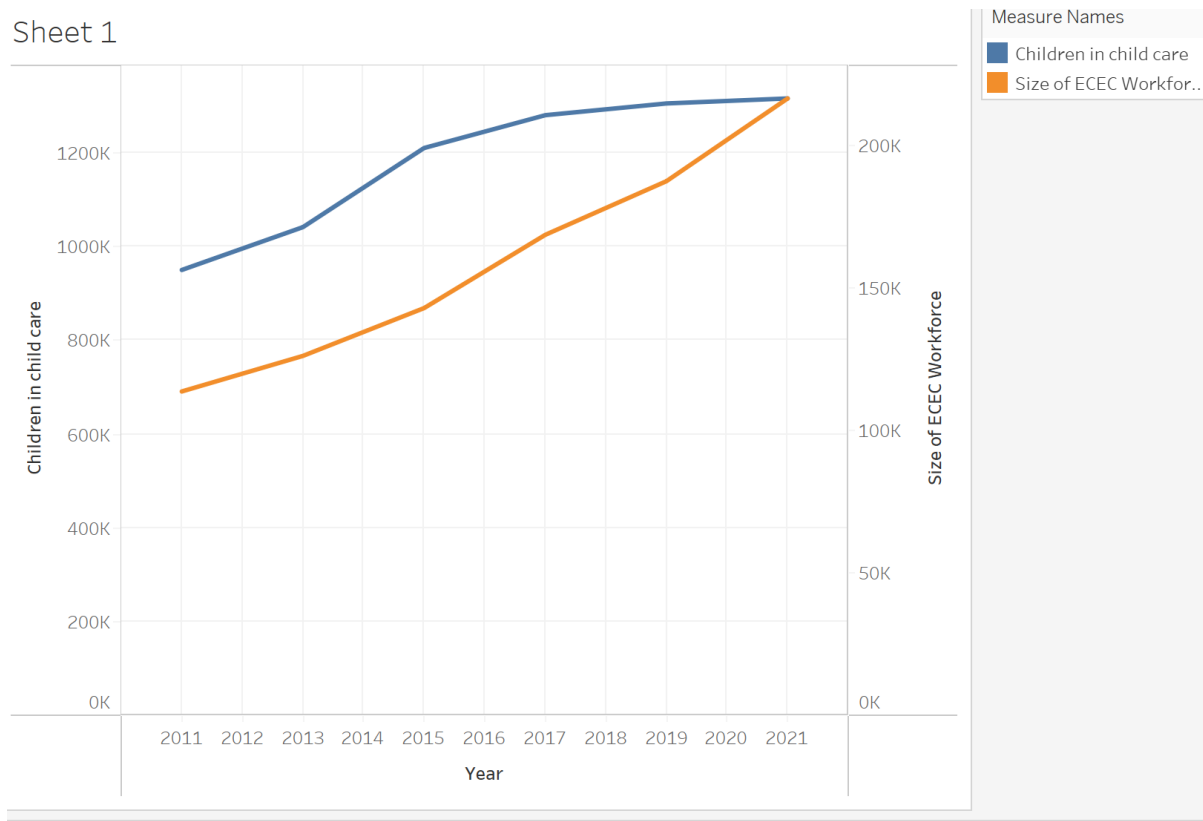
Sheet 3



Progress:

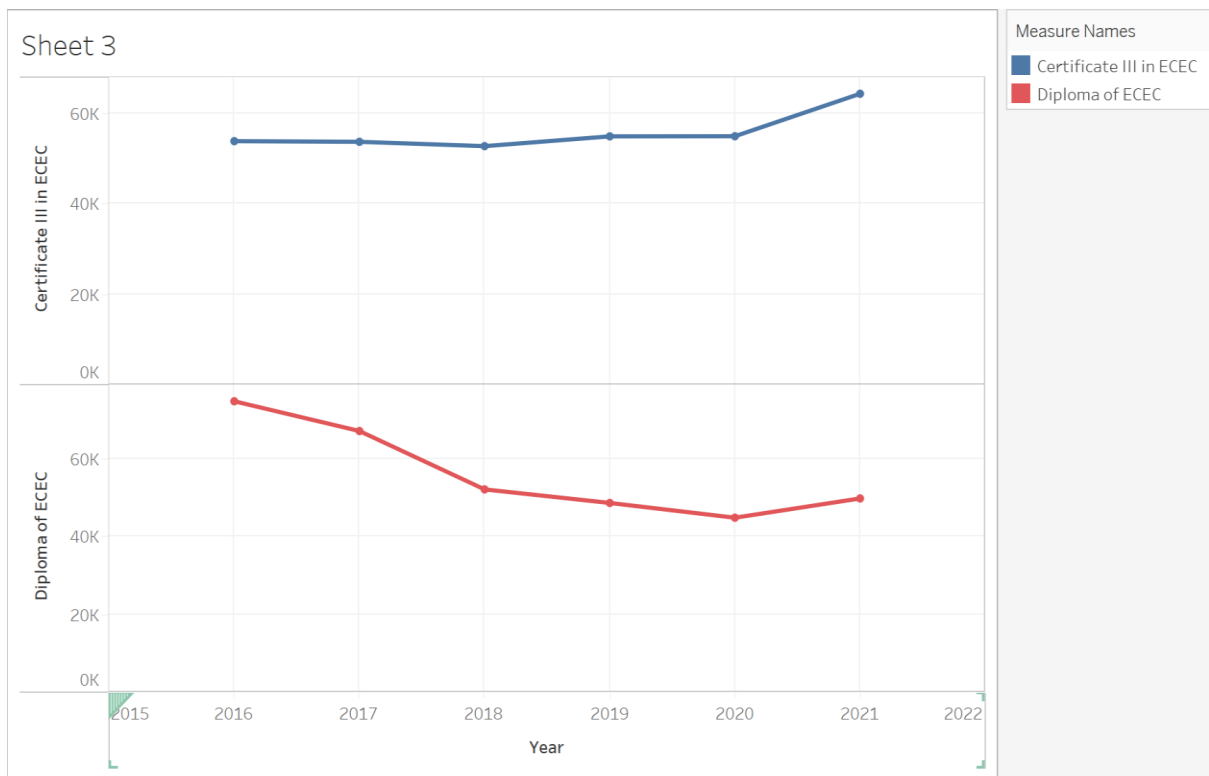
Progress in Line chart:

Sheet 1



Progress in displaying the student per teacher ratio:

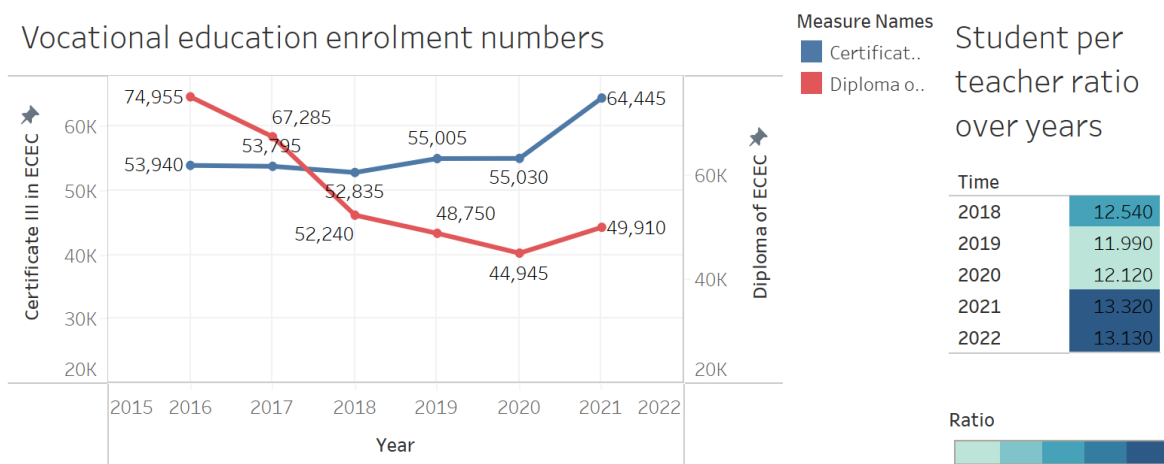
Time	
2018	12.540
2019	11.990
2020	12.120
2021	13.320
2022	13.130



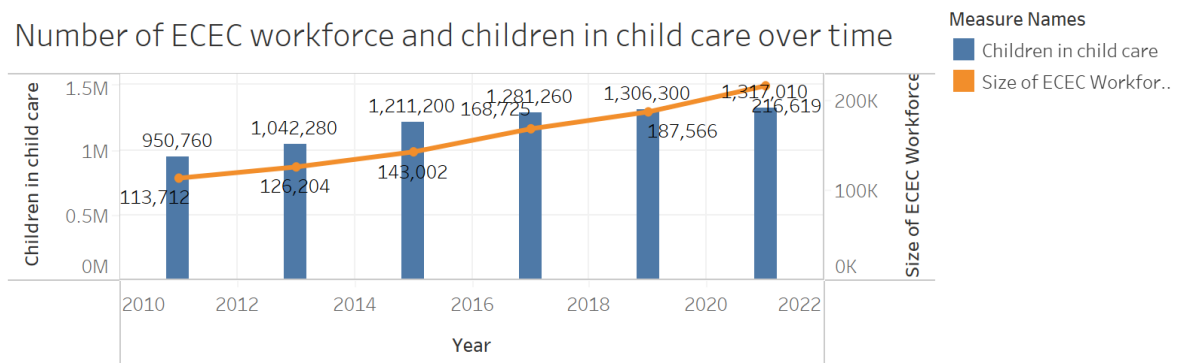
Final Project:

Australia ECEC workforce supply and demand

Vocational education enrolment numbers



Number of ECEC workforce and children in child care over time



Channel table for Dual combinations chart:

Visual Encoding	Dual Combinations
Visual component	Number of ECEC workforce and children in childcare over time
X-Label	Year (From 2011 to 2021)
Y-Label	Number of people
Visual channels	<p>Blue Bars: represents the number of children enrolled in childcare for each year from 2011 to 2021. The scale for this data is on the left y-axis.</p> <p>Orange Line: represents the size of the workforce in the Early Childhood Education and Care (ECEC) sector. The scale for this data is on the right y-axis.</p>
Chart description	The chart highlights a marked increase in childcare enrolment compared to a more gradual growth in the ECEC workforce from 2011 to 2021. This suggests an increasing demand for childcare services, possibly putting pressure on existing resources and staffing in the ECEC sector.

Channel table for highlight table:

Visual Encoding	Highlight table
Visual component	Student-to-teacher ratio highlight table
Chart description	The table emphasizes student-to-teacher ratios in early childhood education, illustrating how the ratio affects educators' workload. No x- or y-specific label is required.

Channel table for Line chart:

Visual Encoding	Line chart
Visual component	Vocational education enrolment numbers
X-Label	Year (From 2015 to 2022)
Y-Label	Number of enrolments
Visual channels	Blue Line: Shows enrolment numbers for the Certificate III in ECEC each year from 2015 to 2025. The scale for this data is on the left y-axis.

	Red Line: represents the number of enrolments in Diploma of ECEC. The scale for this data is on the right y-axis.
Chart description	The chart provides a clear visual comparison of the enrolment trends over time, highlighting significant fluctuations and recovery patterns in vocational education within the ECEC sector.

The dashboard provides a comprehensive view of the supply and demand dynamics within Australia's Early Childhood Education and Care (ECEC) workforce, focusing on vocational education enrollment and the student-teacher ratio over recent years. It combines graphical representations and tabulated data to offer insights into trends affecting the ECEC sector.

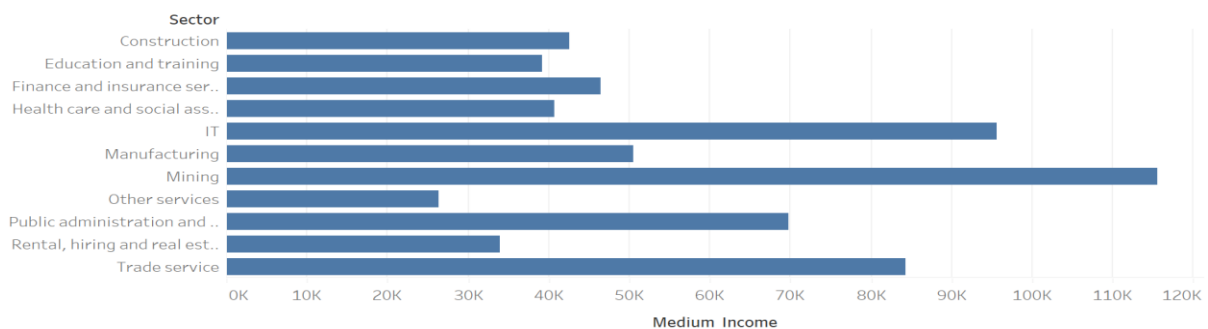
The dashboard also suggests that while the demand for child care services (indicated by the increasing number of children in care) continues to grow robustly, the supply of qualified ECEC professionals is not keeping pace as efficiently, which is also reflected in the rising student-teacher ratios. By observing the Vocational Education Enrollment chart, it's easy to see that the enrolment numbers for Certificate III have sharply climbed to 64,445 by 2021, surpassing the enrolment for the Diploma, which was 49,910. This could be a good sign for the ECEC workforce supply, as the duration to complete a Certificate III is shorter compared to a Diploma, thus the ECEC workforce could be replenished sooner.

4.2 Effects of insufficient recognition and underpaid on the early childhood education workforce in Australia

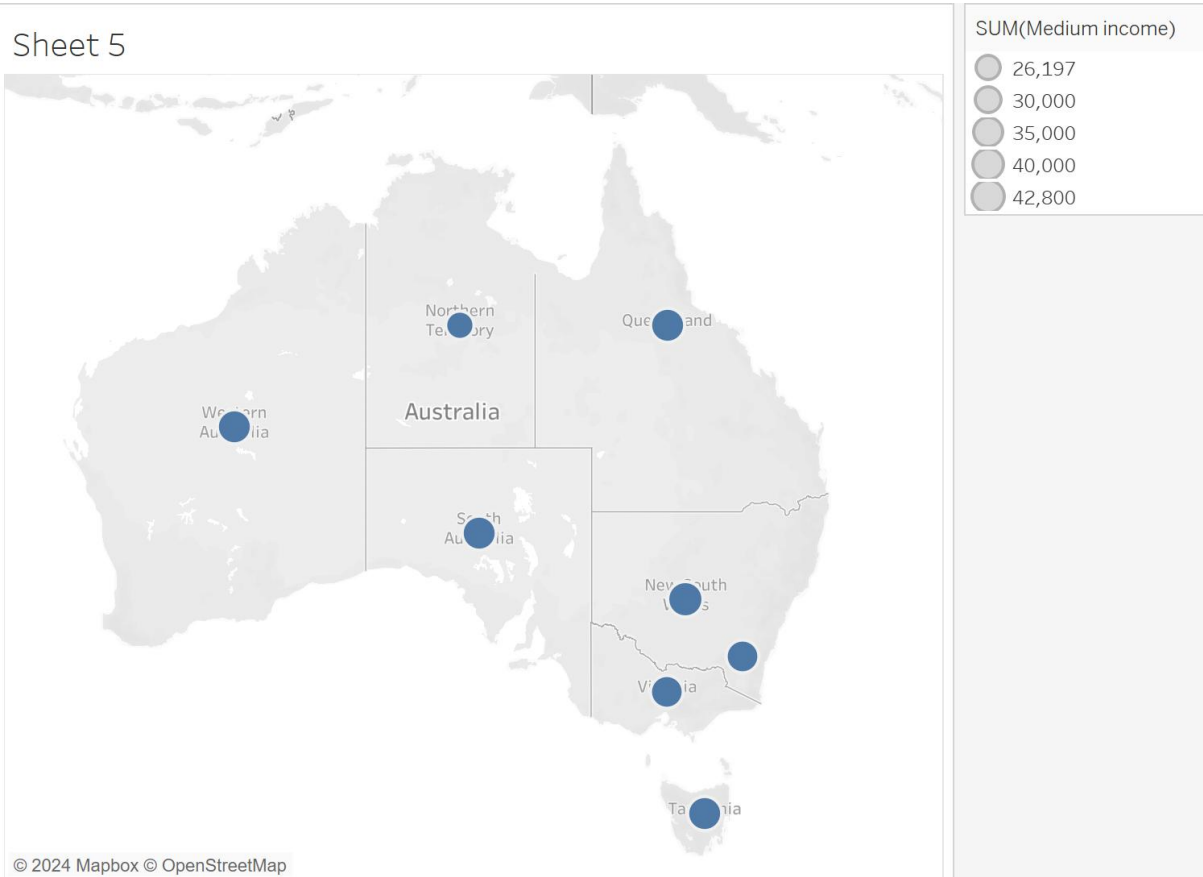
Sketches:

Sketches on horizontal bars:

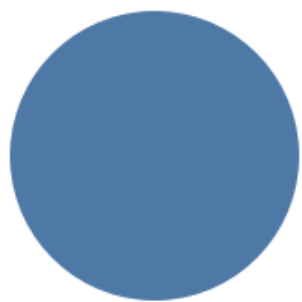
Sheet 4



Sketches on maps chart:



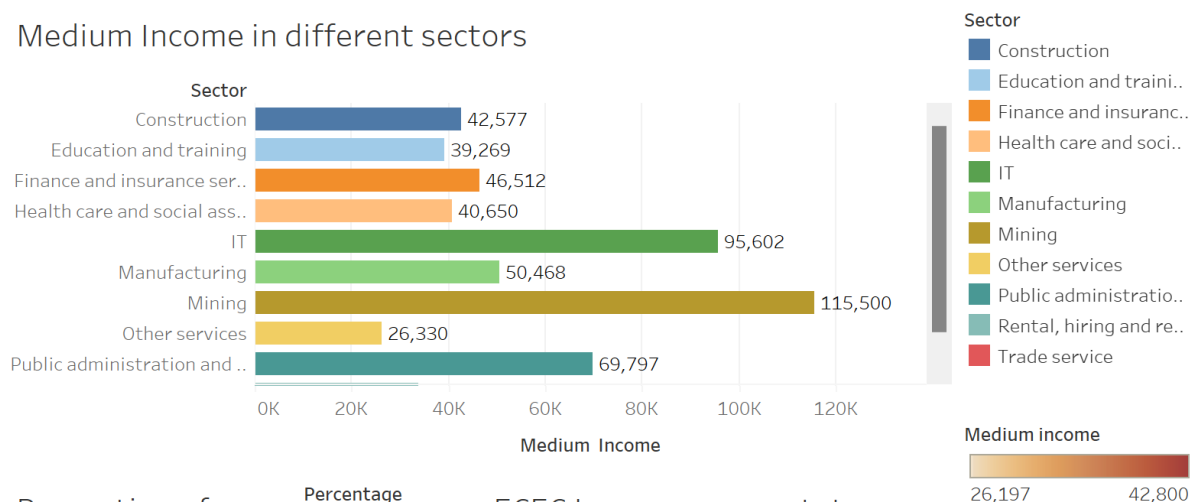
Proportion of hour work in 2021



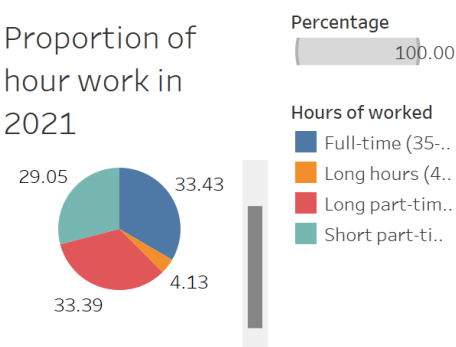
Final Report:

ECEC sector income and hours of worked

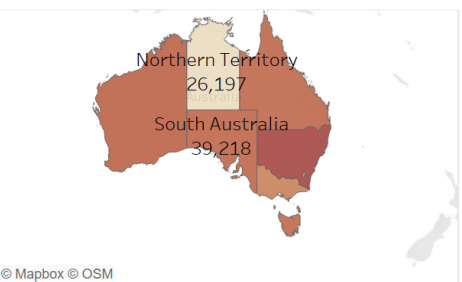
Medium Income in different sectors



Proportion of hour work in 2021



ECEC Income across state



Channel label for Horizontal Bars:

Visual Encoding	Horizontal Bars chart
Visual component	Medium income in different sectors
X-Label	Income
Y-Label	Sectors in the economy
Visual channels	Bars: Each bar represents a different sector. The length of the bar corresponds to the median income level in that sector. Colors: Different sectors are represented by distinct colors to easily differentiate between them.
Chart description	The chart highlights the disparities in compensation across different sectors, providing a visual argument for potential re-evaluation of wage structures, especially in sectors crucial for societal development like education and healthcare.

Channel label for Maps chart:

Visual Encoding	Maps chart
Visual component	ECEC medium income across states
X-Label	Not in used
Y-Label	Not in used
Visual channels	<p>Labels: each state and territory are labelled with its name and the corresponding median income.</p> <p>Colors Gradient: The map uses shades of orange to depict varying income levels across the regions, with darker shades representing higher income levels and lighter shades indicating lower income levels.</p>
Chart description	The map highlights economic disparities within the ECEC sector across Australia. Such disparities may influence the quality of childcare services, availability of skilled professionals, and the overall sustainability of ECEC services in lower-income regions.

Channel label for the Pie chart:

Visual Encoding	Pie chart
Visual component	Proportion of hour worked in 2021
X-Label	Not in used
Y-Label	Not in used
Visual channels	<p>Percentages: Each segment displays a percentage, indicating the proportion of the total that each category represents.</p> <p>Color-coded Sections: Each segment of the pie chart is color-coded to represent a different category of working hours.</p>
Chart description	This chart communicates the proportion of work hours in a visually succinct manner, which is helpful for quick assessments of labour distribution but would benefit from additional context to understand the implications of these distributions fully.

Early childhood educators experience a higher risk of burnout than other occupations, on average, about one-third of qualified educators intend to leave the teaching

profession within four years (Jackson, 2020). The dashboard offers insightful data on income across different sectors and working hours within the Early Childhood Education and Care (ECEC) sector in Australia, highlighting issues of recognition and compensation for workers in this field. By observing the Income Disparity Across Sectors chart, we can easily see that the ECEC sector ("Education and training" on the chart) has a median income of \$39,269, which is lower compared to other sectors such as IT (\$95,602), Mining (\$115,500), and even Public Administration and Safety (\$69,797). This disparity illustrates the relative undervaluation of ECEC professionals in the economic structure, despite the critical nature of their role in early childhood development.

The pie chart Proportion of Hours Worked also details the distribution of working hours for ECEC workers in 2021, with a significant 33.43% working full-time and a small 4.13% working long hours. This distribution suggests that while a portion of the workforce engages in substantial work hours, the compensation may not adequately reflect the demands and responsibilities of their roles.

On the other hand, a map visualization shows varying median incomes for the ECEC workforce across different states, with Northern Territory at the lowest (\$26,197) and NSW at the highest (\$42,800). This geographic disparity further underscores the inconsistencies in how ECEC workers are valued financially across Australia.

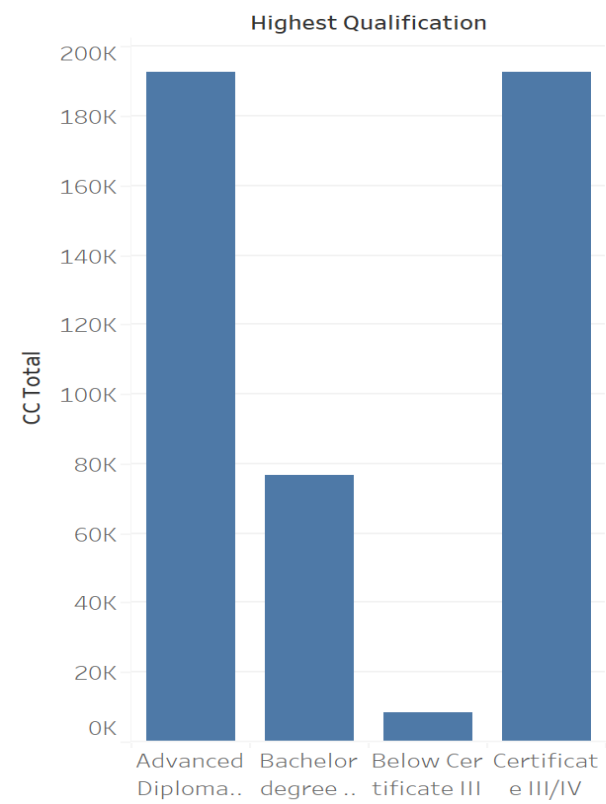
The data from the dashboard, combined with insights from recent news, strongly indicate that the ECEC workforce in Australia is not only underpaid but also inconsistently recognized across different regions. There is a clear need for policy adjustments and increased funding aimed at rectifying these disparities, thereby enhancing the attractiveness of the profession and ensuring equitable wages commensurate with the critical nature of ECEC work.

4.3 Does the level of qualification impact the early childhood workforce

Sketches:

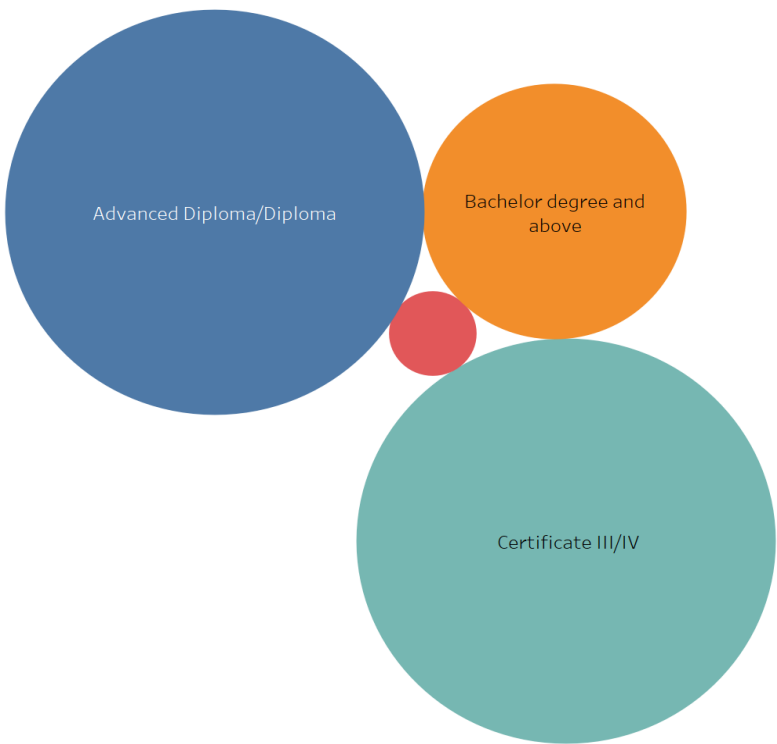
Sketches for qualification visualization:

Sheet 10



Alternative design:

Sheet 10



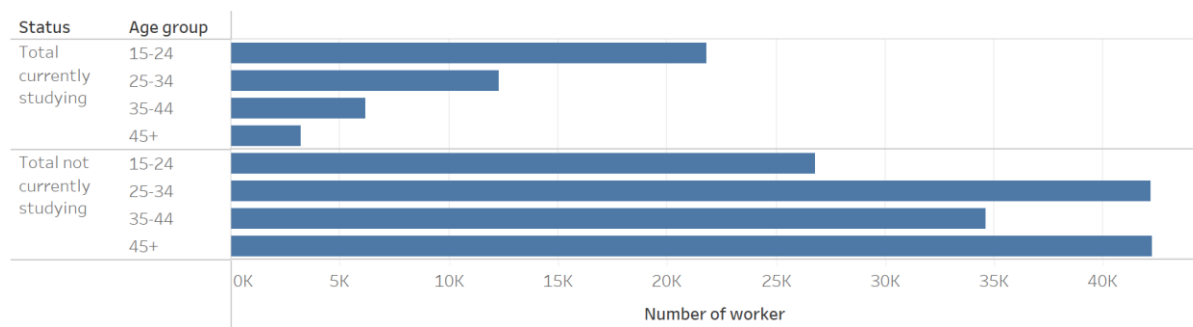
For the Qualification each Age group holding:

Sheet 10

Age Group	Level of ECEC-related qual..	Number	
15-24	Advanced Diploma or Dipl..	6261	Abc
	Bachelor degree and above	8786	Abc
	Certificate I, II or other ce..	47	Abc
	Certificate III	6448	Abc
	Certificate IV	290	Abc
25-34	Advanced Diploma or Dipl..	5653	Abc
	Bachelor degree and above	4475	Abc
	Certificate I, II or other ce..	15	Abc
	Certificate III	1949	Abc
	Certificate IV	208	Abc
35-44	Advanced Diploma or Dipl..	3119	Abc
	Bachelor degree and above	1872	Abc
	Certificate I, II or other ce..	18	Abc
	Certificate III	1034	Abc
	Certificate IV	141	Abc
45+	Advanced Diploma or Dipl..	1606	Abc
	Bachelor degree and above	793	Abc
	Certificate I, II or other ce..	13	Abc
	Certificate III	730	Abc
	Certificate IV	94	Abc

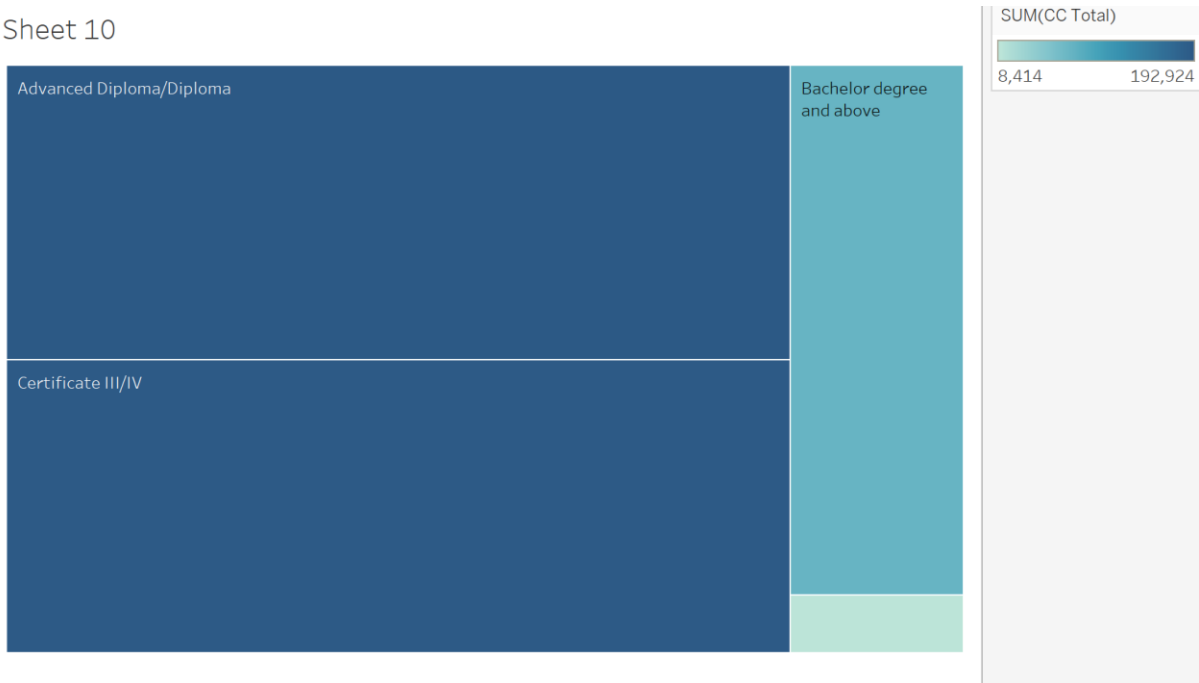
For the Studying status:

Sheet 10

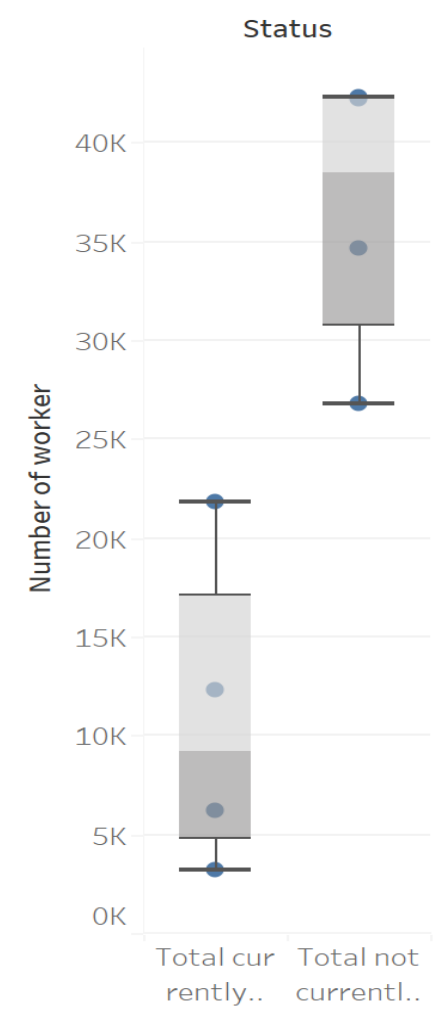


Progress:

For Qualification in the workforce



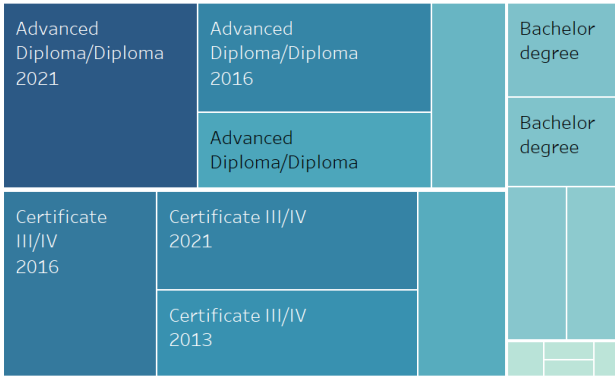
For the Studying status:



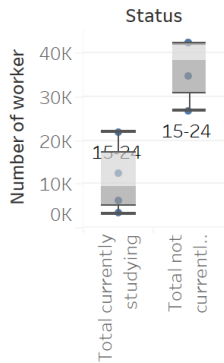
Final Design:

Qualification in ECEC workforce

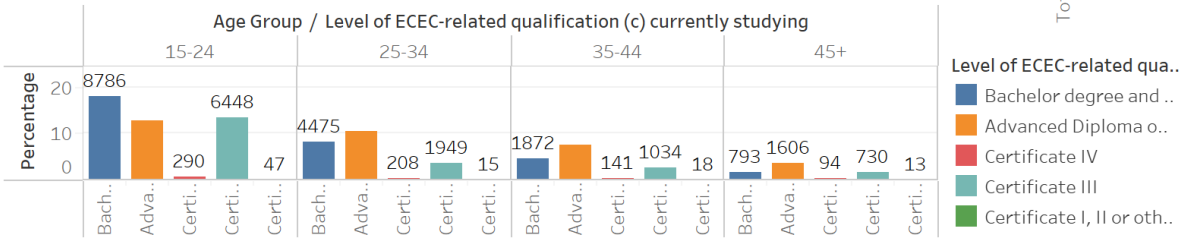
Highest Qualification of ECEC workforce over year



Study status by Age group



Qualification studying by Age group



Channel label for Tree map:

Visual Encoding	Tree map
Visual component	Highest qualification of ECEC workforce over year
X-Label	Not in used
Y-Label	Not in used
Visual channels	Rectangles (Blocks): Each rectangle represents a specific qualification category within the ECEC workforce. The size of each rectangle correlates with the number of individuals holding that qualification. Colors: The chart uses different shades of blue to differentiate the number of individuals holding that qualification.
Chart description	This tree map demonstrates the composition and evolution of qualifications within the ECEC workforce, highlighting how educational backgrounds have shifted or remained consistent over the years.

Channel label for Stacked bars:

Visual Encoding	Stacked bars
Visual component	Qualification studying by Age group
X-Label	Age Groups and Qualifications
Y-Label	Percentage
Visual channels	<p>Bars: Each bar represents the number of students in a specific age group pursuing a particular level of ECEC-related qualification.</p> <p>Colors: Each color signifies a different level of qualification.</p>
Chart description	The stacked bars chart is used in showcasing the educational dynamics within the ECEC workforce, offering insights into how different age groups engage with professional development opportunities.

Channel label for Box and whisker plot:

Visual Encoding	Box-and-whisker plot
Visual component	Study status by Age group
X-Label	Studying status
Y-Label	The number of workers
Visual channels	<p>Boxes: represent the interquartile range (IQR) for each age group.</p> <p>Lines: extending from the boxes indicate the range of the data outside the middle.</p> <p>Dots: represent outliers or specific data points that need attention.</p>
Chart description	This visualization is comparing the study status across different age groups, revealing trends about educational engagement and workforce participation across the lifespan.

The dashboard gives us the opportunity to understand overview of qualifications within the Early Childhood Education and Care (ECEC) workforce in Australia, showcasing trends over the years and detailing the current study status of various age groups.

Firstly, we can easily see that the younger groups (15-24) are notably active in higher education, with many seeking Bachelor's degrees and Advanced Diplomas. This aligns with the increasing requirements for specialized knowledge and skills in ECEC, reflecting higher standards and expectations for educational outcomes. A large number of people in this group are also pursuing a Certificate III in ECEC due to its shorter duration, which accelerates their entry into the ECEC workforce. We have also observed this trend in our analysis of the VET enrolments mentioned above.

Secondly, individuals holding Certificate III/IV or an Advanced Diploma constitute a large portion of the ECEC workforce. This can also be explained by the National Quality Framework (NQF), which states that the qualifications to become an early childhood educator are:

- Certificate III in Early Childhood Education and Care
- Diploma in Early Childhood Education and Care

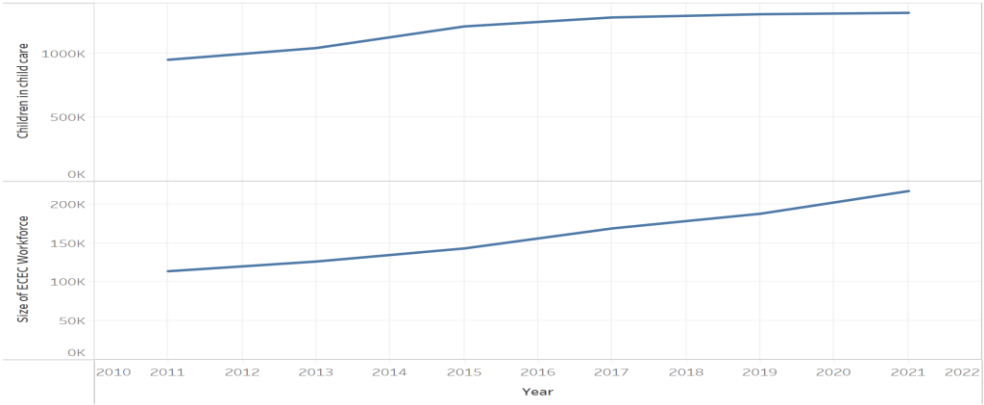
In conclusion, the evolving qualifications within the Australian ECEC workforce as illustrated by the dashboard indicate a sector that is becoming increasingly professionalized and educated. This progression promises improvements in the quality of early childhood education but also calls for continued attention to the development of policies that support and sustain the professional growth and well-being of ECEC workers.

REFERENCES:

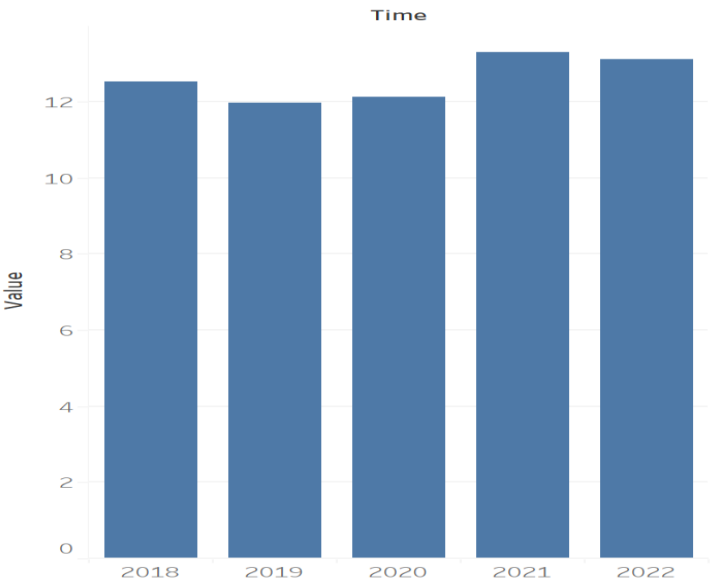
- Cumming, T, Sumsion, J & Wong, S 2015. 'Rethinking early childhood workforce sustainability in the context of Australia's early childhood education and care reforms', *International Journal of Child Care and Education Policy*. vol. 9, no. 2. <https://doi.org/10.1007/s40723-015-0005-z>.
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APPENDIX A:

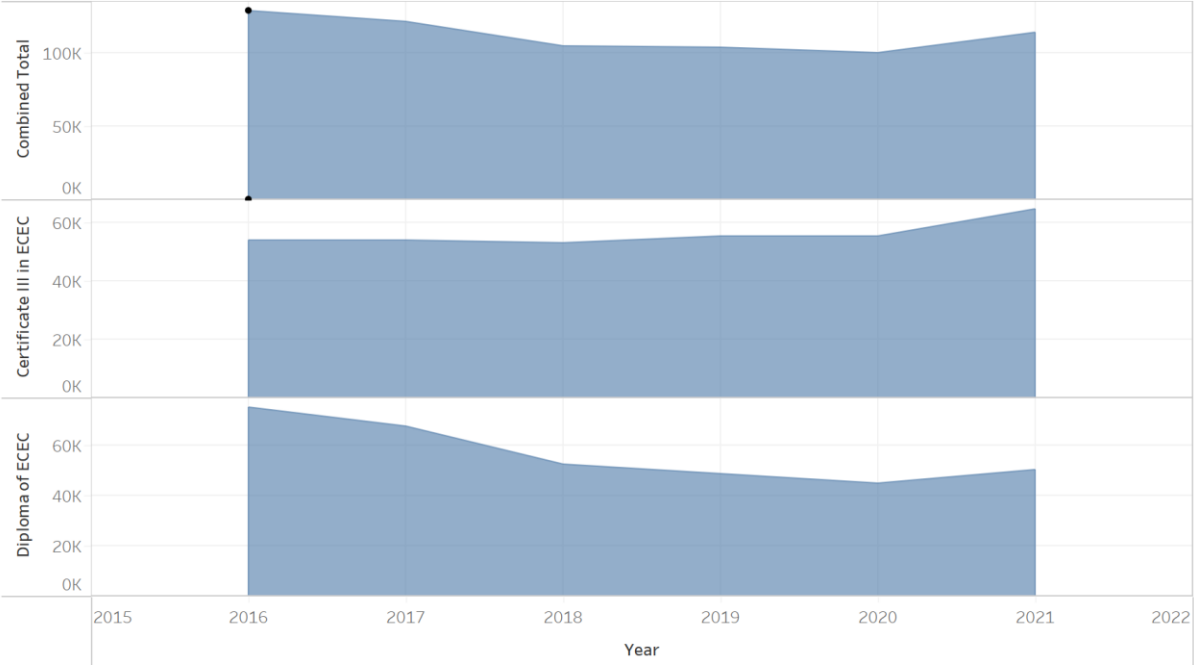
Sheet 1



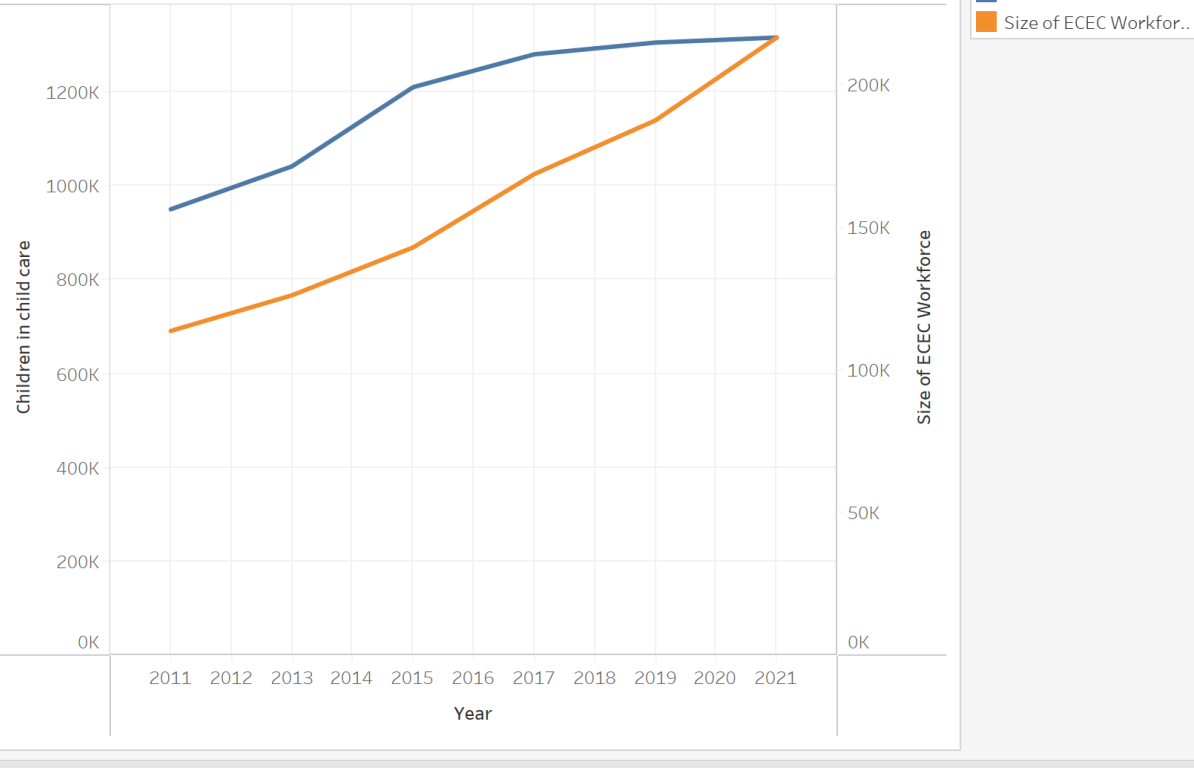
Sheet 2



Sheet 3

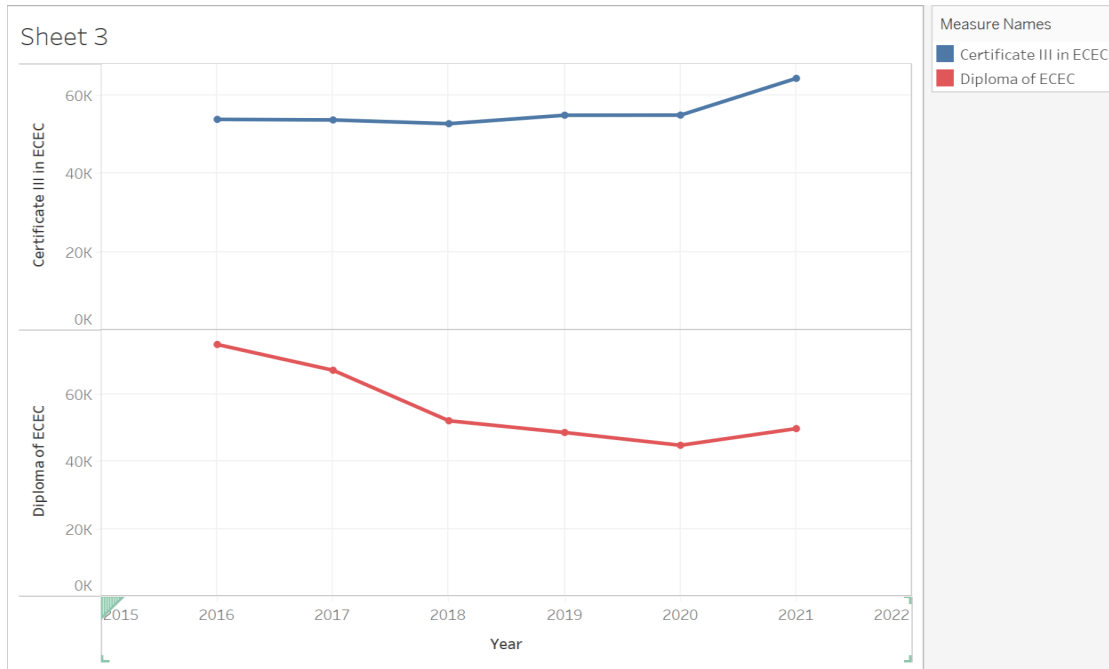


Sheet 1



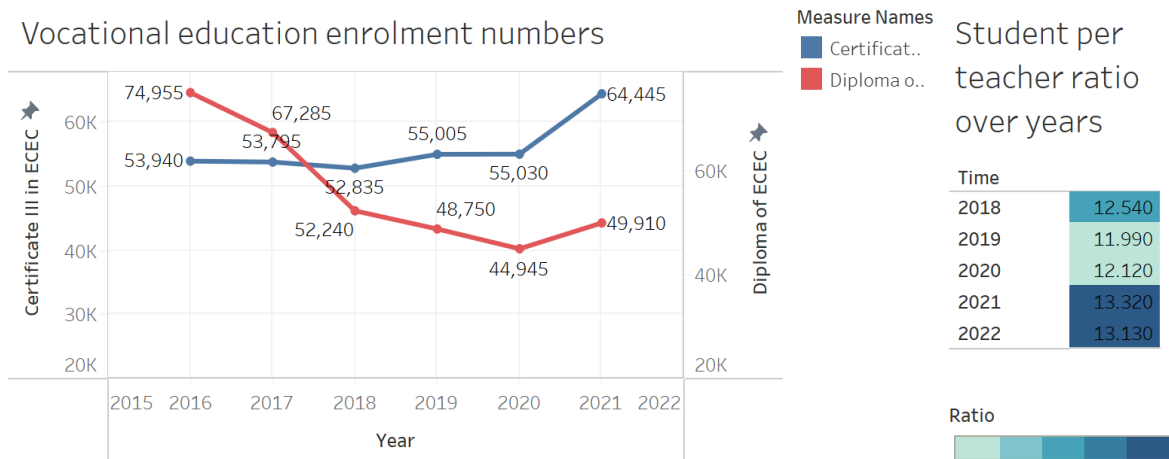
Time

2018	12.540
2019	11.990
2020	12.120
2021	13.320
2022	13.130

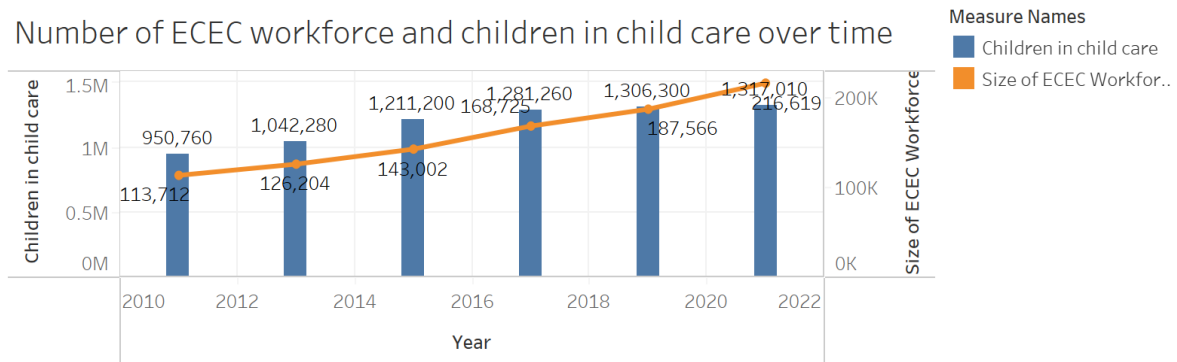


Australia ECEC workforce supply and demand

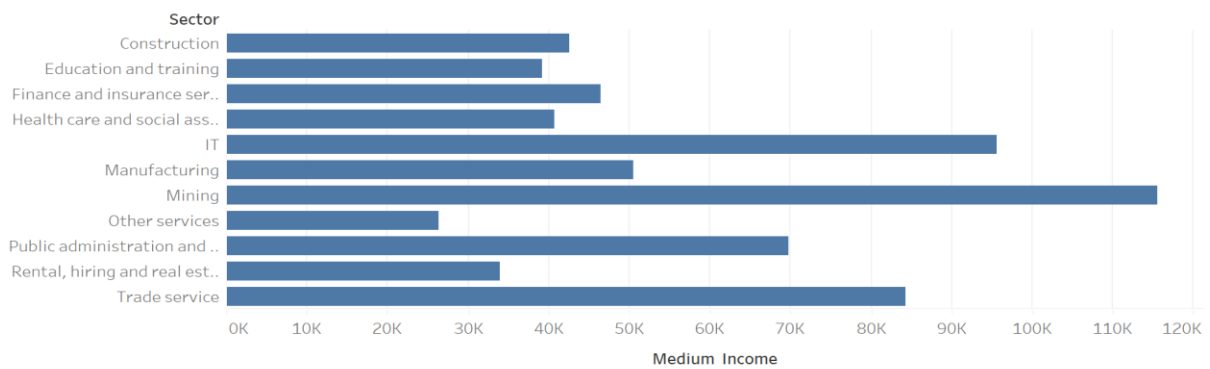
Vocational education enrolment numbers

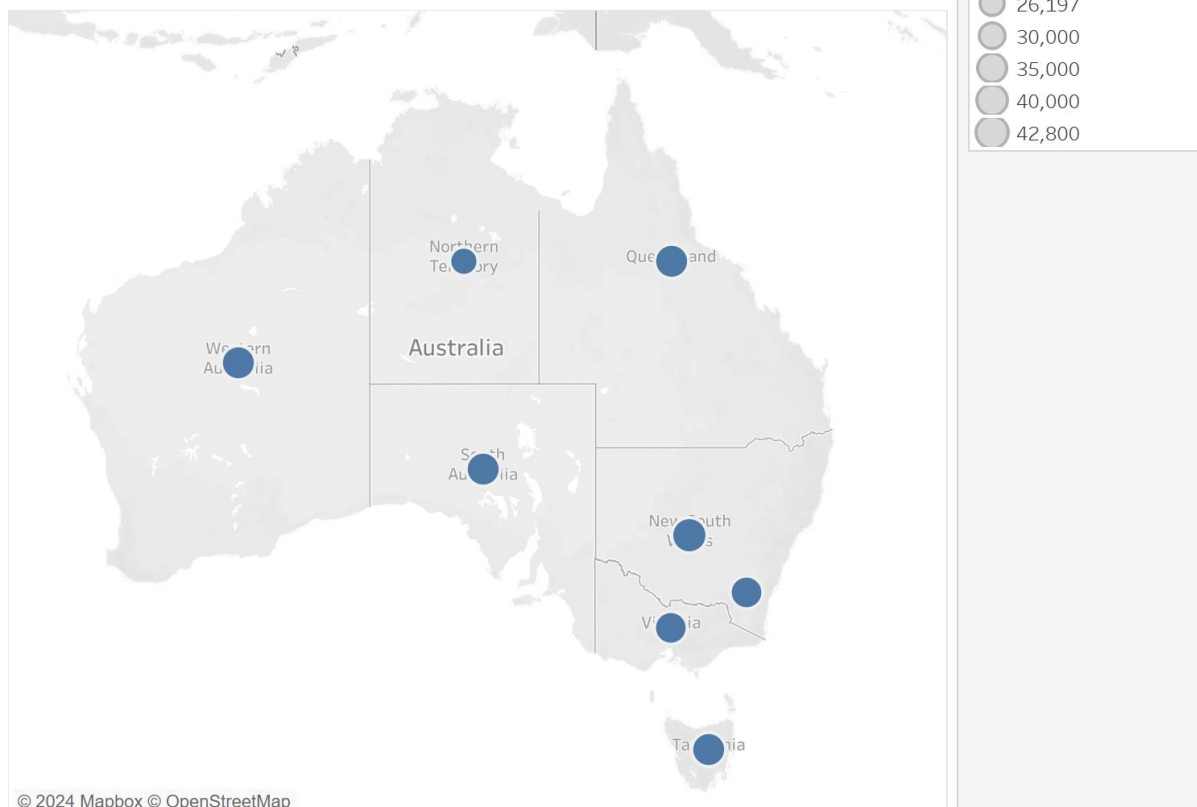


Number of ECEC workforce and children in child care over time

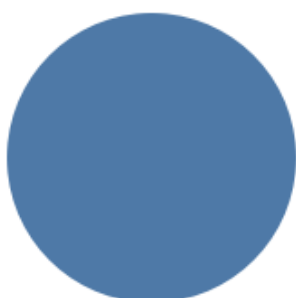


Sheet 4



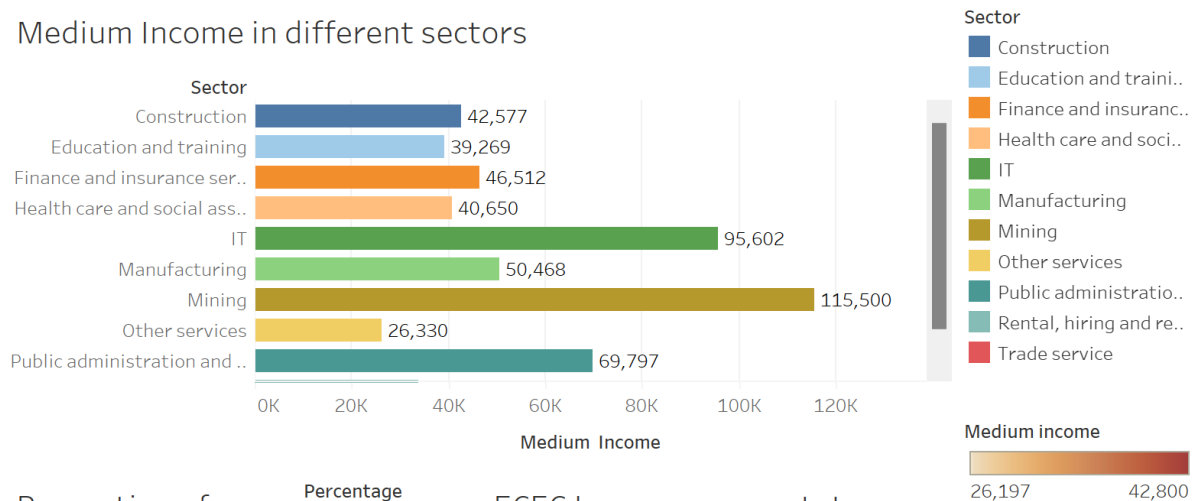


Proportion of hour work in 2021

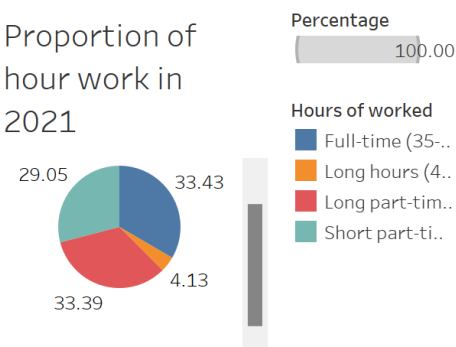


ECEC sector income and hours of worked

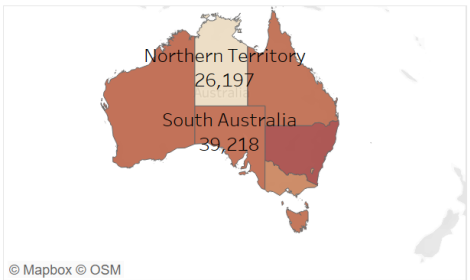
Medium Income in different sectors



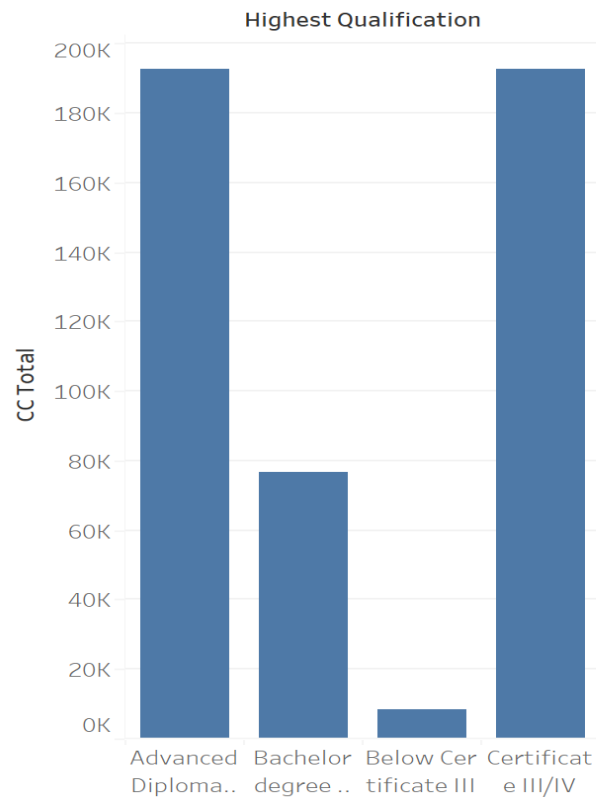
Proportion of hour work in 2021



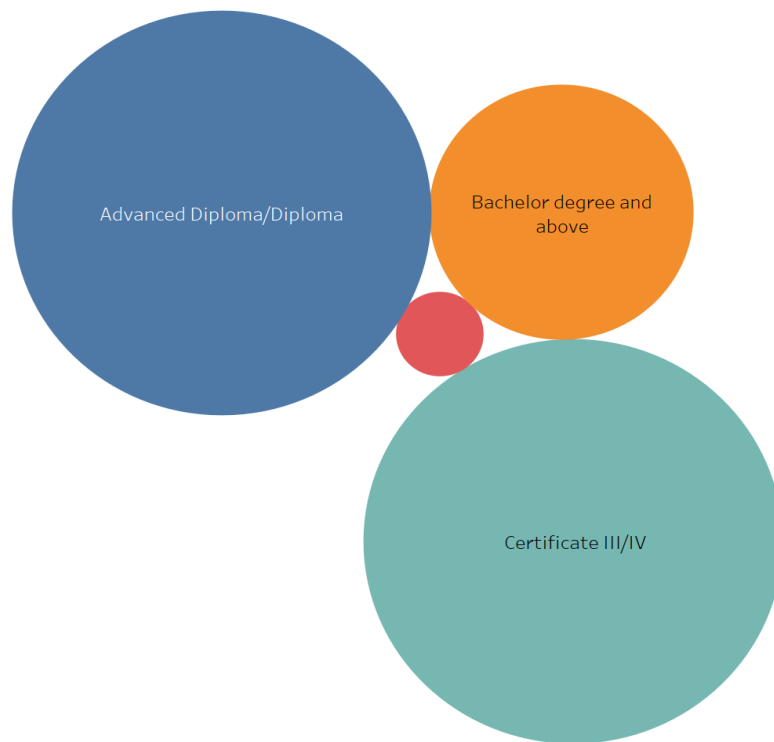
ECEC Income across state



Sheet 10



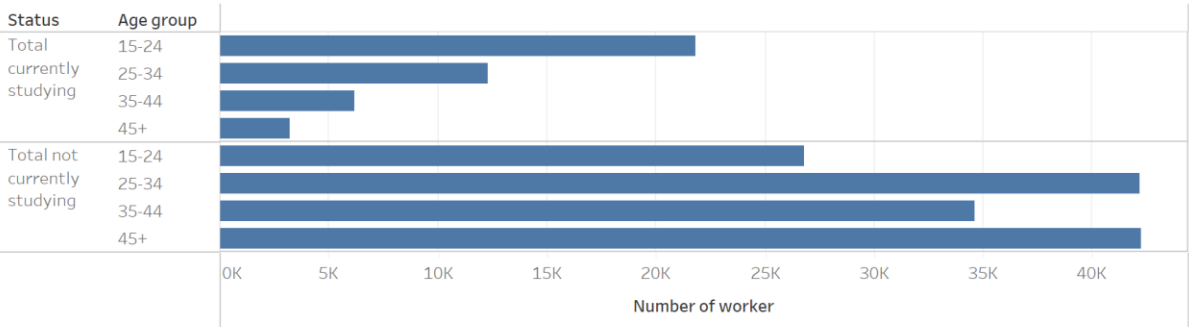
Sheet 10



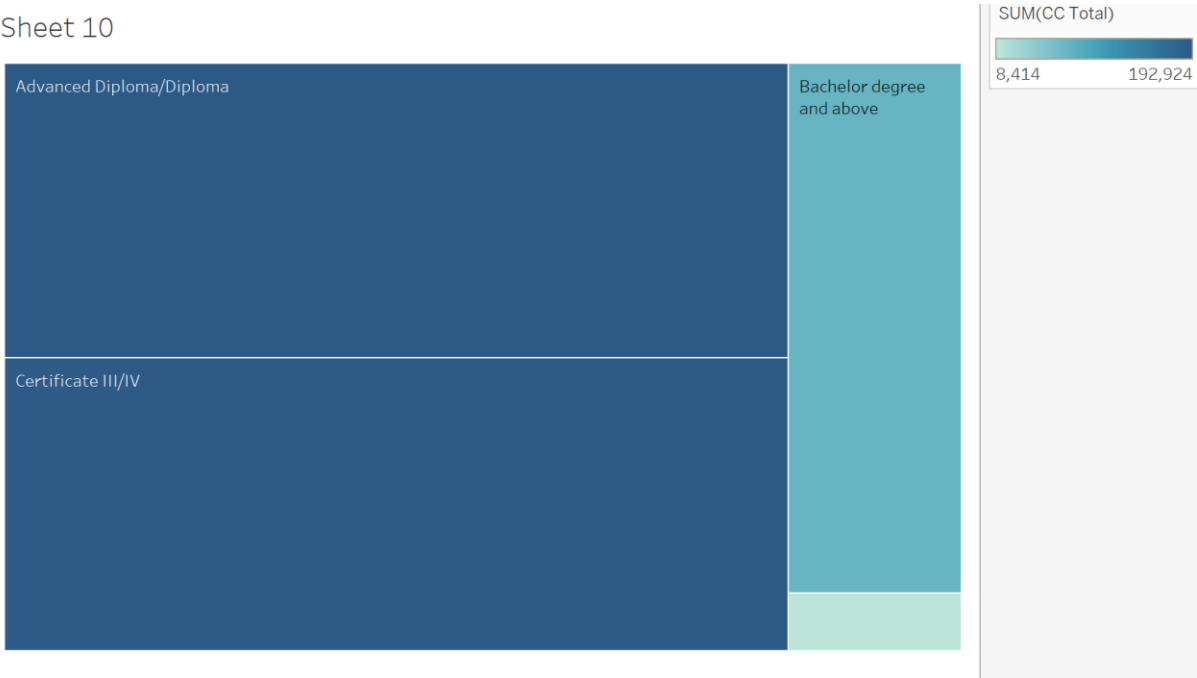
Sheet 10

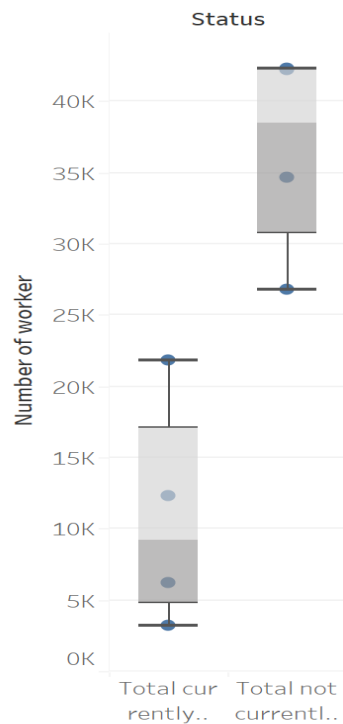
Age Group	Level of ECEC-related qual..	Number	
15-24	Advanced Diploma or Dipl..	6261	Abc
	Bachelor degree and above	8786	Abc
	Certificate I, II or other ce..	47	Abc
	Certificate III	6448	Abc
	Certificate IV	290	Abc
25-34	Advanced Diploma or Dipl..	5653	Abc
	Bachelor degree and above	4475	Abc
	Certificate I, II or other ce..	15	Abc
	Certificate III	1949	Abc
	Certificate IV	208	Abc
35-44	Advanced Diploma or Dipl..	3119	Abc
	Bachelor degree and above	1872	Abc
	Certificate I, II or other ce..	18	Abc
	Certificate III	1034	Abc
	Certificate IV	141	Abc
45+	Advanced Diploma or Dipl..	1606	Abc
	Bachelor degree and above	793	Abc
	Certificate I, II or other ce..	13	Abc
	Certificate III	730	Abc
	Certificate IV	94	Abc

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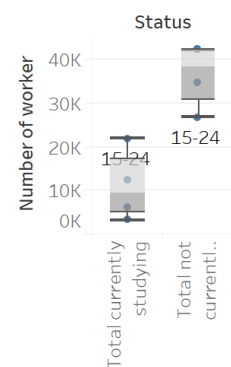


Qualification in ECEC workforce

Highest Qualification of ECEC workforce over year



Study status by Age group



Qualification studying by Age group

