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# Numeracy Competence: The Main Key to Culinary Students' Work Readiness Facing the Industrial World

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**Abstract**

Numeracy competency plays a vital role for culinary arts students in facing the evolving challenges in the industry, especially in the data-driven era. As much as students must hone their cooking skills, culinary arts and management students are expected to be able to manage budgets, cost estimation, data management, and interpretation that will improve the decision-making process. However, many culinary schools focus on the practical work required in the kitchen, while the provision of numeracy skills is sometimes neglected. This article examines the relevance of numeracy competency in culinary students' employability through a number of reports on related studies. The findings of the analysis indicate that there is a gap between the level of numeracy skills required by the industry and the skills possessed by culinary students. In this regard, curriculum updates are needed to create a balance between the practice and teaching of numeracy skills and the application of numerical technology. Methods such as problem-based learning (PBL) and utilizing restaurant management software can develop these skills in culinary students, preparing them for the dynamics of the rapidly changing culinary industry.

**Keywords:** Numeracy Competenc*,* Work Readiness, Culinary Students

## Introduction

In the context of the rapid increase in various culinary experiences, especially in the era of Industry 4.0 which is marked by digitalization and automation, the demands of the workforce in this industry are increasingly sophisticated. Along with technical cooking skills, numeracy competencies, namely the ability to reason and apply numbers, both abstractly and practically, are becoming increasingly relevant to prepare culinary arts students to enter the workforce. Numeracy includes various skills such as counting, budgeting, data analysis, and the use of technology that utilizes numbers to make decisions (Baker et al., 2020; Keenan & McCafferty, 2019).

Having good numeracy skills facilitates culinary students in managing culinary businesses such as planning raw material procurement, setting selling prices, and determining and analyzing financial information that is very important for effective decision making (Jones & Williams, 2020). This is increasingly relevant in culinary businesses that integrate technology to run their operations and increase efficiency. As a result, numeracy competency is now considered a skill that is not only relevant to cash management but also to managing the operational aspects of the increasingly busy culinary world (Zhang & Li, 2021).

However, although numeracy competency has and is even recognized as having a very important role, referring to many culinary education programs, they prioritize mastery of practical skills in the kitchen, while the numeracy aspect is often neglected. Through research conducted by Roberts & Hardy 2018 it was found that many culinary students do not feel sufficiently trained to apply numeracy skills, especially in financial management and data analysis of culinary business operations. This weakness has an impact on the level of student readiness

to meet the demands of this industry which is increasingly competitive in cost management and service. In this case, numeracy skills are not only needed for budgeting and cost control but also for rational decision making such as menu planning, demand forecasting and managing input inventory levels (Graham, 2017). Research by Stone & Hargrove 2020 also supports the fact that the lack of understanding of how numeracy and the underlying data can be applied to kitchen operations and restaurant management is one of the reasons. In the same paper, it was proven that many culinary education institutions ignore the most basic aspects of numeracy skills. As a result, students are underprepared for industry needs, where data-heavy analytics and technology are key to improving efficiency and profit margins.

Good numeracy skills are also needed to understand and analyze not only quantities but also various business metrics, such as Food Cost Percentage and Return on Investment that determine the financial viability of a restaurant. In a study by Kovac & Singh, it was found that less talented managers or chefs are at risk of financial losses due to lack of budget planning or use of natural resources. For example, they may have to adjust their menu prices to fluctuating raw material prices or may fail to forecast sales based on historical data.

Therefore, it is imperative for culinary education programs to better integrate numeracy competencies into their curriculum. By emphasizing more structured and applied numeracy learning, culinary students will be better prepared for a workforce that is increasingly dependent on technology and data. For example, Brown & Grant 2022 recommend that culinary education provide more opportunities for students to develop numeracy skills that are useful in cost management, budget planning, and data analysis for more effective decision making in the culinary industry. Effective application of numeracy can help students understand the relationship between operational decisions and business sustainability, so that they are not only skilled in the kitchen, but also have the ability to manage other financial and operational aspects.

This article aims to explore the role of numeracy competency in culinary students' work readiness through a literature review of various relevant sources. Based on this literature review, this article will identify the challenges faced in developing numeracy competency in the culinary field, as well as provide solutions to improve culinary students' numeracy skills, so that they are better prepared to face the demands of the ever-growing industrial world.

## Method

The method used in this article is a literature review, which includes collecting, evaluating, and analyzing discussions from previous studies on the impact of numeracy competency on culinary students' work readiness. Literature collection was carried out by searching for relevant articles and journals from various agricultural moral sources such as Google Scholar, JSTOR, and ScienceDirect.

Furthermore, the criteria for selecting literature in this article are three main categories. First, relevance, which means articles that discuss numeracy competency in the scope of culinary education, as well as competency between student work readiness. Second, quality or, studies in accredited journals. Third, time or time span, namely choosing studies published in the last 5 to 10 years so that the results of the analysis produce an updated picture of the culinary world and education. After that, the article is processed through an analysis method that includes identifying complete themes, processing identical findings, and tidying up or exploring various relationships between numeracy competency and culinary students' work readiness.

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# Results

### *Numeracy Competence in Culinary Education*

Skills in measuring ingredients, calculating recipe proportions, and time management are vital in the culinary industry. Keenan & McCafferty (2019) emphasize that accuracy in measuring ingredients and understanding the proportions in a recipe affects the final result of the dish produced. In addition, this factor plays an important role in maintaining quality, which is a key element in professional kitchen operations (Baker & Guarino, 2020). On the other hand, time management is also an equally important numeracy skill. Stevenson & Miller (2021) stated that the ability to calculate the time required in the cooking process and prepare a production schedule is essential to ensure that customer requests can be met on time, without sacrificing quality. In this case, effective time management plays a major role in increasing kitchen efficiency and smooth production processes.

In addition, numeracy competencies in the managerial aspects of the culinary business include the ability to plan costs, manage budgets, and analyze finances. Jones & Williams (2020), argue that culinary students who have expertise in analyzing financial data will be better able to make better budget plans and manage resources, which ultimately increases operational efficiency. This is reinforced by the findings of Smith & Thompson (2021), which explain that a deep understanding of budget management helps reduce waste, keep costs under control, and maximize profit potential. In addition, with these skills, culinary entrepreneurs can set more appropriate selling prices, based on more careful cost analysis and profit margins (Patel & Kumar, 2022). Salinger & Moore (2022) also emphasize that numeracy skills are very important in managing cash flow more effectively, which is crucial for the sustainability of the culinary business.

Along with technological advances in the culinary sector, numeracy skills have also expanded to the use of business management software. Zhang & Li (2021) show that data-based software such as cloud-based inventory management and production planning systems can improve efficiency in managing raw material stock and reduce waste. The use of this software provides analysis related to raw material demand trends that allow for more precise and efficient purchasing planning (Cook & Harris, 2020). In addition, with sales management and data analysis software, culinary entrepreneurs can monitor business performance more accurately and respond to market changes more quickly (Chavez & Rodriguez, 2022). Stewart & Lenton (2023) also emphasize that this technology improves operational efficiency and supports data-based decision making, which is essential to adapt to the dynamics of the ever-evolving culinary market.

### *Culinary Student Job Readiness*

The job readiness of culinary students is greatly influenced by their ability to master numeracy skills, in addition to practical cooking skills which have so far been more focused on. Zhang & Li (2021) emphasize that today's culinary professionals must have skills in managing finances, using restaurant management software, and making data-based decisions to improve operational efficiency and business performance. This is also supported by research from Carter & Horne (2019), which shows that culinary students who understand numeracy skills can be more efficient in managing costs and setting more appropriate prices. This management, according to Hayes & Lewis (2020), provides a competitive advantage, because they can make decisions based on more precise and strategic data. Smith & Thomas (2021) also note that numeracy skills enable culinary students to design better business strategies, which can improve their long-term success.

However, despite the growing recognition of the importance of numeracy skills, many culinary students feel inadequately trained in these skills. Roberts & Hardy (2018) revealed that many culinary students feel underprepared in terms of financial management and data analysis, which are essential skills in the culinary world. Research by Miller & Grey (2020) supports this finding, showing that culinary programs teach more practical skills in the kitchen, but pay less attention to the numeracy skills needed in business management. This impacts students' ability to make informed decisions regarding resource management and culinary business profits. Clark & Johnson (2022) also added that students' inability to master these numeracy skills can be a barrier to increasing the profitability of their restaurants.

The gap between the numeracy skills needed in the culinary industry and the skills possessed by culinary students remains a major challenge. Research by Thompson & Bell (2017) revealed that most culinary programs do not sufficiently teach the numeracy skills needed to support financial management and data analysis in the culinary business. Many culinary education programs focus more on technical cooking skills without paying enough attention to numeracy skills. This is in accordance with the findings of Porter & Lewis (2019), which showed that culinary students often have difficulty adapting to industry needs that demand broader managerial skills, including data analysis and budget management. Wright & O'Donnell (2021) also emphasized that the lack of numeracy skills in the culinary education curriculum can affect the work readiness of graduates, who may face challenges in managing a culinary business efficiently.

***Challenges in Developing Numeracy Competencies in Culinary Education***

Culinary education currently faces significant challenges in developing numeracy competencies, which are highly needed by the culinary industry. Many culinary programs place greater emphasis on developing technical skills in the kitchen, such as cooking and presentation techniques, while teaching numeracy and managerial skills is often neglected. Brown & Grant (2022) found that most culinary programs prioritize practical skills in the kitchen and focus less on cost management and data analysis to support business operations. As a result, culinary students often struggle to manage budgets and plan operations effectively when they enter the workforce. Research by Hayes & Lewis (2020) states that a lack of financial management skills can hinder the smooth operation of a culinary business. Research by Thompson & Bell (2017) also revealed that many culinary programs do not place enough emphasis on teaching numeracy skills, leaving students underprepared for the demands of the industry.

Furthermore, Kovac & Singh (2022) show that many culinary programs fail to integrate numeracy and managerial skills into the practical experiences they offer. This leaves culinary students with a lack of in-depth understanding of financial management and difficulty in dealing with operational challenges when working in the culinary industry. Without good numeracy skills, they struggle to make decisions that can affect the continuity and profitability of the business. Research by Roberts & Hardy (2018) shows that the teaching of numeracy skills in many culinary programs is often inadequate, even though these skills are very important in the culinary world. Clark & Johnson (2022) also highlight that the failure to integrate numeracy skills into the culinary curriculum can exacerbate the gap between student abilities and the needs of the industry which increasingly prioritizes data analysis and efficient management.

Ultimately, students' inability to master these numeracy skills can hinder them in managing the financial and operational issues they face in the workplace. P. Smith & Thomas (2021) assert that without adequate numeracy skills, culinary students will have difficulty making the right decisions regarding resource management, pricing, and budget management. (Porter & Lewis (2019) also found that a curriculum that does not include these managerial elements risks leaving graduates underprepared to manage a culinary business that requires efficient cost

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and resource management. Therefore, it is important to balance the teaching of practical cooking skills with in-depth numeracy skills, so that culinary students can be better prepared to face the challenges in the industry.

***Solutions to Improve Numeracy Competence in Culinary Education***

To overcome the challenges in developing numeracy competencies among culinary students, several approaches can be applied to improve numeracy skills needed in the workplace. One of them is by implementing a problem-based learning (PBL) method, which invites students to solve real problems that require numeracy skills. J. Smith & Larkin (2021) recommend that culinary students be given practical assignments, such as preparing a restaurant operating budget or calculating production costs in a more complex culinary project. In this way, students can hone their numeracy skills in contexts that are directly relevant to the workplace, such as budget management, cost analysis, and financial planning. This approach gives them the opportunity to learn through direct experience that can be applied in the field.

In addition, integrating technology training into the culinary curriculum can also strengthen students' numeracy skills. The use of restaurant management software or data-driven applications for menu planning and financial management will provide students with hands-on experience in handling the financial and operational aspects of a restaurant. As explained by Chen & Martin (2020), this introduction to technology not only improves numeracy skills but also prepares students for the culinary industry that is increasingly dependent on data and technology. Data-driven restaurant management applications allow students to calculate costs, analyze profit margins, and monitor expenses in real time, providing invaluable experience in an increasingly digital workplace.

Research by J. Smith & Green, (2022) also emphasizes the importance of technology integration in culinary education, given the industry's increasing trend of automation and data-driven systems to improve efficiency. For example, software to monitor raw material inventory and manage orders automatically can help restaurant managers reduce waste and improve accuracy in planning. With experience using these tools, students will not only improve their numeracy skills but also be better prepared to make operational decisions that can impact restaurant efficiency and profitability (Papadopoulos, 2019).

Furthermore, project-based learning methods that involve managing real financial data from culinary businesses can help students understand the importance of numeracy skills in the real world. They can be asked to analyze financial data from an existing restaurant or design a strategy to improve the financial performance of a struggling restaurant (Roberts & Hardy, 2018). This approach provides students with a deeper understanding of how numeracy skills play a role in effective business decision-making, and prepares them for real-world challenges in the culinary industry. By implementing these solutions, culinary education can close the numeracy skills gap and prepare students to meet the demands of an increasingly complex and data-driven culinary industry.

## Discussion

Numeracy competency in culinary education is essential in preparing students to face the challenges in the culinary industry. Numeracy skills including measuring ingredients, calculating recipe proportions, and time management play a major role in ensuring the quality of cooking and the efficiency of kitchen operations (Baker & Guarino, 2020; Keenan & McCafferty, 2019). The ability to manage time properly is also crucial, because calculating the time needed to cook and planning production can ensure that customer demand is met without sacrificing quality (Stevenson & Miller, 2021).

Therefore, numeracy skills in technical areas, such as time management and measuring ingredients, greatly support smooth operations in the kitchen. On the other hand, numeracy skills related to culinary business management, such as cost planning and financial analysis, are also no less important. Culinary students who have these skills can manage budgets better, avoid waste, and set the right selling price based on cost calculations and profit margins (Jones & Williams, 2020; T. Smith & Thompson, 2021). This skill also helps culinary entrepreneurs to manage resources efficiently and achieve optimal profits (Patel & Kumar, 2022). Thus, numeracy skills in culinary business management play a role in increasing business competitiveness and sustainability.

In addition, technological advances have significantly contributed to numeracy skills in the culinary industry. Data-driven software for inventory management, production planning, and sales analysis can help improve operational efficiency and make more informed data-driven decisions (Cook & Harris, 2020; Zhang & Li, 2021). The use of this technology allows culinary entrepreneurs to respond to market changes more quickly, increase efficiency, and support more accurate planning for better business management (Stewart & Lenton, 2023).

However, despite the increasing recognition of numeracy skills, many culinary students feel they lack this skill. Many culinary education programs focus more on technical cooking skills, while numeracy and managerial skills are often overlooked (Miller & Grey, 2020; Roberts & Hardy, 2018). Research results show a gap between the numeracy skills needed by the industry and the skills possessed by culinary students (Porter & Lewis, 2019; Thompson & Bell, 2017). This makes it difficult for students to manage culinary businesses efficiently after graduation. Therefore, it is important to develop a curriculum that not only teaches practical cooking skills, but also provides sufficient understanding of numeracy skills that support culinary business management.

To overcome this problem, one solution is to implement Problem-Based Learning (PBL), where students are given real problems that require numeracy skills, such as budgeting or calculating restaurant production costs (Susanto & Prasetyo, 2020). With this approach, students will be better prepared to face industry challenges that require stronger numeracy skills. In addition, the application of technology in the culinary curriculum can also strengthen students' numeracy skills. The use of data-based software for financial and operational management will provide practical experience in resource management and prepare students to work in an industry that is increasingly dependent on technology (Putra & Suryani, 2020; Utami & Nugroho, 2019). This technology helps students to manage data more efficiently and make better decisions.

## Conclusion

Numeracy competency plays a key role in culinary education, encompassing skills in measuring ingredients, calculating recipes, time management, and cost planning. These skills not only ensure optimal cooking quality, but also improve kitchen operational efficiency and better financial management. Unfortunately, many culinary programs still focus on technical cooking skills, neglecting the teaching of numeracy and managerial skills that are much needed in the industry. To address this challenge, the Problem-Based Learning (PBL) approach offers an effective solution by providing students with opportunities to face real-world situations that hone their numeracy skills, such as budget planning and calculating production costs. On the other hand, the use of data-based technology, such as managerial software for menu and financial management, will enrich the student experience and strengthen their ability to make careful and strategic decisions. With a more balanced approach between technical and numeracy

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skills, culinary students can be better prepared to face the challenges of an increasingly data-driven industry, and be more competitive in running an efficient and successful culinary business.

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