Vinaigrette Variation

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Abstract. A Vinaigrette is an emulsion of oil and vinegar, with some added spices, and is a well know ingredient of many different salads. It has a number of interesting properties, ranging from intriguing looks - the little green bits of spices seemingly floating in the oil and vinegar - to its purpose for the salad itself, adding taste and helping the digestive system to absorb valuable ingredients. The authors have set out to explore alternatives for a classic vinaigrette using TRIZ tools. The purpose of the investigation is threefold: Firstly, could this exercise be used in chemistry classes of secondary education? Secondly, can viable alternatives be discovered? And thirdly, how easy is it to use TRIZ tools in the kitchen (chemistry)?

Keywords: TRIZ, Secondary School Education, Teaching, Cooking, Vinaigrette, Chemistry.

1 Introduction

In the last few years, several schools in the surrounding of Eindhoven, the Netherlands, have started to teach the basis of TRIZ and creativity to the secondary education schoolchildren [1]. One aspect of this teaching has been to teach TRIZ for general problem solving, thus making it applicable to a wide range of topics – beyond the purely technical applications that is the classical domain of TRIZ. With this in mind, it is easy to include TRIZ in education subjects such as Design, where many different topics are combined. It has been more problematic, however, to include TRIZ in the curriculum of classical subjects such as Mathematics, Physics or Chemistry. At least partially, this is due to the fact that, for these subjects, very specific contents have to be taught in a tight time schedule, and that these contents are often best described in an abstract way. TRIZ by contrast is best taught in fuzzy, real-life circumstances. The present case sets out as a study case for Chemistry. In a 'vinaigrette' several underlying chemical principles are present in which the non-mixing of oil and water is the most important. Next to that the hydration of dried elements (e.g. spices) can be taken into account (entrapped air leads to floating). And since the subject is from the kitchen, it remains important to work within the boundaries of edible solutions.

2 Case requirements

A study case suitable for secondary school education should meet a number of requirements:

Firstly, the case should be relevant in an "academic" setting, whereby specific items that are important for the understanding of chemistry, for example chemical formula's and reactions, can be taught, explained and experienced.

Secondly, the case should show a relevance to problems occurring in everyday life, thus illustrating the relevance of chemistry – and TRIZ – to solving problems occurring in everyday situations [2].

Thirdly and lastly, the case should invoke curiosity in the schoolchildren, as, in this way, students are generally more involved, have more interest – and fun - and achieve better learning results [3].

3 The case

As the subject for the case a specific kitchen recipe was chosen. Cooking is a nice subject for Chemistry as it can be done by everyone, and while often performed casually, science, and particularly chemistry, can be used to explain and demonstrate the results in detail. The scientific aspect is evident particularly when looking at molecular cooking [4], but even in everyday cookbooks a reference to science can be found [5]. The recipe chosen, a vinaigrette is an emulsion of oil and vinegar and it is usually served with a salad [6]. Other ingredients are often added as well. The following Table 1 gives an overview of the most commonly used ingredients and their function:

Table 1. The most common ingredients and their respective function.

Ingredient	Function
Oil	Different types can be used depending on taste and texture of the salad.
Vinegar	Different types can be used depending on taste and texture of the salad.
Salt	Taste enhancer
Pepper	Adds flavor, visually attractive black dots
Mustard	Adds flavor, also emulsifier

Various settings can be used in school environments as the starting point for the case, three examples of which are:

3.1 Case setting #1: Missing ingredients

A man making a salad for his dinner discovers that one ingredient, for example the vinegar, is missing when he wants to make a vinaigrette for the salad. He wants to serve the salad with some tasty addition, so what should he do?

3.2 Case setting #2: New alternatives

A cook in a restaurant gets bored with always serving a common vinaigrette. He or she is looking for an alternative, something that fulfills the same function as a vinaigrette but adds a nice novel twist. How could that alternative look or taste like?

3.3 Case setting #3: Making a better vinaigrette

A scientist in a big food company notices one of the disadvantages of the vinaigrette, for example, that the acid in the vinegar quickly deteriorates the color and texture of the fragile salad leaves [7]. She sets out to improve this disadvantage. What could she do to solve this problem?

It should be pointed out that many variations of the basic vinaigrette are known, and that the purpose of the exercise should not be to create new to the world sauces for salads, but rather to teach a creative approach to analyze and solve a problem.

4 TRIZ and the case

4.1 Case introduction

Before being exposed to the case the students will be taught the basics of TRIZ. Approaches for this are outlined in detail in other papers [1, 8]. Typical TRIZ tools that can be applied here are, for example, Cause Effect Chain Analysis [9] to get a good understanding of a problem situation, and Resource Analysis [10] to gain knowledge on the resources that are available to solve the problem. This is then followed by the problem solving activities, where a selection of the Inventive Principles [8] is applied to the problem situation to find solutions.

It is crucial to keep in mind that the complexity of the TRIZ tools used should be matched with the knowledge level of the students. Based on our experience in teaching TRIZ we find that it is more important to teach a mindset that is open and curious, rather than to adhere stringently to the way of working in the classical TRIZ sense. Furthermore, as the case is concerned with an everyday activity and with widely available ingredients, any solutions found can be readily put to practice, tested and tried.

4.2 Analysis

The authors took it upon themselves to work through case setting #2, though they did take into account the other case settings as they went on. As an example of a possible analysis, Figure 1 shows an overview of different functions/benefits of a vinaigrette. This overview can be quite helpful to identify any benefits to be improved upon in case setting #3, and furthermore to identify the functionalities of any missing ingredient from case setting #1.

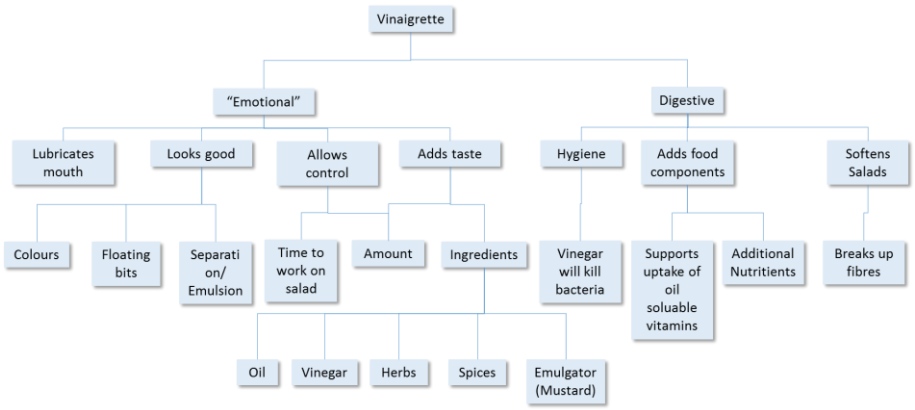

Fig. 1. An overview of different functions/benefits of a vinaigrette

A simple and typical example of a resource analysis would be to look for suitable ingredients in a (well-stocked) kitchen cupboard. This exercise was performed by the authors of this article and revealed the results shown in Table 2.

Table 2. Resource analysis per ingredient.

Ingredient	Alternative resources
Oil	Oil (sunflower, olive, sesame…), butter, margarine, cream and other fat dairy products, chocolate (white, milk, dark), cocoa butter, coconut oil.
Vinegar	Vinegar (plain, wine, apple, balsamic…), lemon juice, Cola, tomato juice, other fruit juice: orange, pineapple, apple…, beer, soy sauce, buttermilk
Mustard (rheological aids)	Egg yolk (emulgator), aquafaba, mustard, iota, gelatine, agar
Others	Spices and herbs, yoghurt, other lean milk products, protein milks like soy milk

4.3 Problem solving

A selection of the inventive principles were subsequently applied using some of the ingredients to come up with new (to the authors) ideas of how to create a vinaigrette.

Inventive Principle SEGMENTATION. The idea was to solidify the vinaigrette and afterwards to segment it into small parts. Experimentally the components of a vinaigrette were mixed thoroughly and then dissolved in heated agar. This was then left to cool and set in the fridge. The next day some separation of the oil and vinegar was visible and while, based on the volume, some oil was still incorporated in the solid mixture, the experiment was deemed to be a failure.

A second idea born from the principle of segmentation was to solidify only the vinegar component. To this effect, a sheet of rice-paper was soaked in balsamic vinegar and subsequently dried in the oven. The dried sheet kept the nice spicy tang of the vinegar. Broken up this could be added with oil to a salad to add the vinegar taste – but with a nice added crunchy rice-paper structure.

A further refinement step was to fry the vinegar-infused rice-paper in oil, changing it into puffed rice paper (compare krupuk). However, this step caused the taste to disappear.

Inventive Principle NESTING. The idea was to store the vinaigrette in another (potential) ingredient such as Pasta. In this way, the storage container would contain the vinaigrette for a longer period and protect the tender salad from the influence of the vinegar. The pasta variety "bucatini" was chosen, small, hollow macaroni-type tubes with the length of spaghetti. It proved difficult however to seal the bucatini tubes in a satisfactory manner. Blanched chives proved not to be solid enough to bind the pasta shut, and small plugs fashioned from carrots did not seal well. Furthermore, the amount of enclosed vinaigrette was rather small compared to the size of the pasta causing an imbalance of tastes in the final dish.

Inventive Principle PRELIMINARY ACTION. The idea was to store the vinegar phase in another ingredient. Some of these ingredients are readily available such as pickling onions. We also tried to pickle raisins and strawberries in balsamic vinegar, as well as onions in yoghurt. The pickling onions worked reasonably well. The raisins turned out to be too sweet to harmonize with the balsamic vinegar chosen. The strawberries in balsamic vinegar exhibited a harmonized pleasant taste, though it was noticed that the acids in the vinegar will compromise the structure of the strawberry rather fast. Finally, the onions in yoghurt also had a pleasantly matched taste. Here it was found that quite some time was needed for the yoghurt to infuse and soften the texture of the onion in a satisfactory way.

Inventive Principle ANOTHER DIMENSION. This inventive principle inspired the idea to utilize foam as a carrier of the vinaigrette. Aquafaba, the cooking juice of chickpeas, served as the base ingredient. It worked well as a carrier of both, oil and vinegar, creating a whitish nice foam with hardly own taste and a pleasant texture. Like a vinaigrette, it does suspend those colored spicy bits of herbs well within its body, but unlike a vinaigrette, it will sit nicely and decoratively on top of a salad, also preventing a premature exposure of much of the salad to the acids of the vinegar.

5 School children practice

To ensure that the case is workable with secondary education schoolkids, a test-group of four pupils 14 or 15 years of age, tried out the case. As outlined above, the pupils were introduced to the basic TRIZ mindset, using a number of mini-cases, stories

and quizzes. They were then exposed to the case setting #2, finding new alternatives for a vinaigrette. The Resource analysis tool was then explained, and they were asked to identify potential resources. The list they drew up was much comparable to the one shown in Table 2. Following the resource analysis the 10 Inventive Principles and how they could be used to solve the task at hand, were explained. They then proceeded to create ideas on new Vinaigrette Variations. Examples of these ideas include:

Create two types of salads, one with the oil base and the other with the vinegar base and lay them out side by side on a plate. The customer can either mix them or pick one of the other according to his or her preferences.

Incorporate the vinegar in a cupola shaped base, for example rice paper and let it dry. Place the cupola above the salad, and serve the oil separately. The customer can then pour the oil over the cupola, which will melt, and fall onto the salad for consumption.

Freeze the vinaigrette, oil, vinegar and spices etc. Break up the frozen vinaigrette into small bits, and serve them mixed in-between the salad.

Make a jelly for example from Gelatine, including the vinaigrette and the salad. Serve like a slice of a terrine.

Make a sweet vinaigrette, for example from honey, lemon and yoghurt. This will fit much better when the salad is served with sweet soft drinks.

Overall the group was very enthusiastic about the exercise, and if time had permitted, would have undoubtedly continued to experiment with their ideas in the kitchen. They were also surprised to see that, using the TRIZ way of working they could come up with a great variety of ideas on a topic none of them was previously familiar with.

6 Conclusion

Vinaigrette variations have proven to be an excellent case to teach the relevance of TRIZ for finding creative solutions to secondary school children. This is due to the immediacy of the case, children get a hands-on experience of chemistry, and the result and impact is directly visible and relevant to them. While classical aspects of Chemistry teaching such as “what is an emulsion”, or “why does water and oil do not mix”, could not be integrated into these initial experiments with the case, it can readily be seen how those aspects could be incorporated. Finally, as the case provides an accessible platform for experimentation, everything can be tested and tasted using readily available ingredients, and an atmosphere of experiment and fun is almost guaranteed.

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References

1. Dobrusskin, C., Baaijens, H., & Stoop, M.: TRIZ for schools. In: Proceedings of the MATRIZ TRIZfest 2017 International Conference, September 14-16, 2017, Krakow, Poland.
2. Technasium, Wat is het technasium? (in Dutch), http://www.technasium.nl, last accessed 2018/04/13.
3. Guin A., TRIZ Pedagogy. P. 3. Performance Press, USA, 2016.
4. McGee H, On Food and Cooking, the science and lore of the kitchen, 2nd edn. Simon & Schuster (2004).
5. Blanc R.: Blanc Mange, The mysteries of the kitchen revealed. 1st edn. BBC Books, London (1994).
6. Le Cordon Bleu, p. 71. 1st edn. Ebury Press (1992).
7. Blanc R.: Cooking for friends. P. 43. Paperback edition. Headline Book Publishing, London (1994).
8. Dobrusskin, C. Aspects of teaching TRIZ. In: Proceedings of the TRIZ Future Conference 2016, October 24 - 27, Wroclaw, Poland.
9. Dobrusskin, C. On the identification of contradictions using Cause Effect Chain Analysis. In: Proceedings of the TRIZ Future Conference 2015, October, Berlin, Germany.
10. Koltze K., Souchkov V. Systematische Innovation, pp. 50 – 54. Hanser Verlag, Muenchen, Wien (2011).