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CLIL in tertiary education – developing material for the course, Scientific Writing in English

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Content and Language Integrated Learning (CLIL) is a dual-focused approach to teaching an additional language through a particular subject. CLIL as a concept is mostly and very effectively used within bilingual education. CLIL as a methodology provides teachers with very creative means to prepare course materials. Our PhD course, Scientific Writing in English includes biomedical students who need specific knowledge and skills when writing their PhD dissertation. The course material was developed using CLIL, taking students' specific interests and needs into consideration. Their scientific writing needs to focus on simplicity with clear-cut, to-the-point sentences while using similar structures and improving their field-specific linguistic intelligence. Their choice of language affects their success in conveying the message of their research outcome. The course material was built by using the structure of the revised Bloom's Taxonomy starting each lesson with the engagement of lower-order thinking skills and widening the focus towards higher-order ones. Students' receptive and productive skills are activated while their expertise in the given topic improves. According to students' feedback, the interactivity of the lesson aids comprehension, and the structure helps digest the topic. However, their habits of receiving content in a frontal lecture-style way make them less open to new styles and strategies for processing material.

Keywords: *tertiary education, CLIL, developing material, Scientific Writing, Content and Language Integrated Learning*

Introduction

Content and Language Integrated Learning (CLIL) has long been a tool for teachers to teach a second language by using specific content in the classroom. David Marsh used the phrase CLIL in 1994, though it first referred to the teaching methodology of bilingual education. In nearly 30 years, the tendency of using the methodology has spread into tertiary education as well (Jámbor et al., 2021) promoting creative, motivating, engaging course settings. The idea of *"being able to think about something in different languages can enrich our understanding of concepts, and help broaden our conceptual mapping resources"* (Marsh, 2000:8) underlay the process of creating the tasks for the course. Course material developed by CLIL takes the needs of students into focus as *„content and method are based on the learner's reason for learning"* (Hutchinson et al., 1987:19) and while the given subject is introduced through interactive tasks, their level of language skills improves, too.

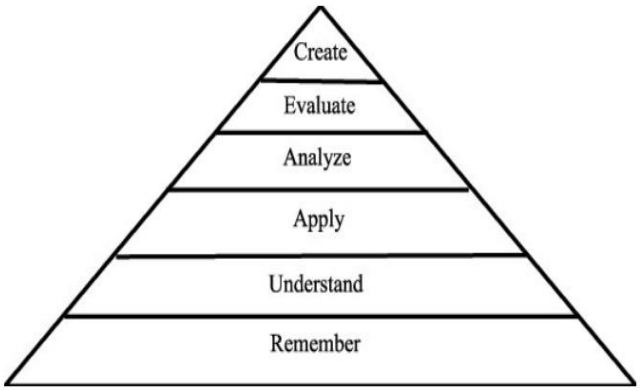
Another crucial factor when it comes to content-based education is how the lesson is built from the first step to the last. In tertiary education, the most focused goal is to improve higher-order thinking skills (HOTS) (Marsh, 2013). Lessons begin with lower-order thinking skills (LOTS) and the tasks are then going towards more difficult HOTS while "*tailoring and personalizing learning of content with the English language and conceptual scaffolding*" (Marsh et al., 2013:42). The use of LOTS and HOTS has been first mentioned by Bloom in 1956.

The six levels of the original Bloom's taxonomy are knowledge, comprehension, application, analysis, synthesis, and evaluation. They serve as a tool for setting up effective learning objectives. Implementing more dynamic concepts, Anderson et al. revised the taxonomy in 2001, thus providing teachers with a more complex tool for teaching and assessing in the language classroom. Even the change in the names of the levels helps teachers gain a deeper understanding of what to support in the classroom. The six levels of cognitive processes

are remembering, understanding, applying, analyzing, evaluating and creating (see Figure 1). The first three are lower-order thinking skills (LOTS), the second three are higher-order thinking skills (HOTS). Using the revised taxonomy helped us to set up clearer objectives for students' education and assessment before building our course material.

We aimed to build the material by involving the LOTS first, going gradually towards HOTS activities. A CLIL teacher aims to create activities that push students forward towards metacognitive knowledge within each of the six cognitive processes. This results in a deeper understanding of the content and more creative use of the language (Kovács, 2015:21-22).

Figure 1. Bloom's Revised Taxonomy – cognitive processes



The Department of Languages for Specific Purposes at Semmelweis University holds a semester-long PhD course titled Scientific Writing in English with a view to following CLIL guidelines to support students with a deeper understanding of the course material and the English language. The course offers PhD and TDK (Students' Scientific Association) students a better understanding of the process of writing an article, it aids a closer perspective on how the different sections are written and provides a hands-on experience on the use of language and its linguistic tools.

The course material has been developed through the use of the CLIL approach. The reason for doing so among other reasons was that Semmelweis University became a member of a large international project and started to implement CLIL in its curriculum (CLILMED, 2019-2021). Content in our case is the process of writing scientific articles. It reflects upon how they are prepared, and what syntactic and linguistic tools should be used when writing. The language of mediation is English. This article aims to show how particular guidelines of CLIL have led to the formation of an interactive course where students are required to take responsibility for their learning process.

Following Swain's recommendations, students "*need to have their linguistic abilities stretched to their fullest"* (Swain, 1993:160), the tasks set off interaction and so the output is pushed through them. The use of the revised Bloom's taxonomy was applied during the preparation of classroom work. Examples illustrate how particular tasks improve different skills. The article demonstrates how CLIL can be implemented in the tertiary classroom in our Scientific Writing in English course. It also reflects upon the feedback received on the experiences of students.

The CLIL process – language acquisition and mastery of content

The specificity of the CLIL methodology is the parallel presence of the acquisition of language and mastery over the content. Learners gain specific knowledge about the process of coherent

linguistically precise scientific articles in our course. The dual approach of CLIL enables them to dig deeper into the content while none of their focus is on the use of FL. They use the FL as a tool through which they convey the message. Thus their FL improves – even more so if the structure of the lesson starts from easier activities and opens up towards harder, more complex ones. As opposed to LSP teaching, the focus in the CLIL classroom is not on teaching but the process of learning and the effectiveness of inclusion. Every student's needs are important so the activities are built to meet different needs.

The role of the content teacher

The responsibilities of a content teacher are versatile. Content teachers identify the right content to be used in the classroom and use strategies to aid language acquisition (Marsh et al., 2012). Planning each lesson, preparing the evaluation and using the language are well-known responsibilities for LSP teachers but promoting the language and being a part of the team in the classroom is of a different perspective. Designing material is of an essence and the way language development is integrated into content requires the CLIL teacher to be a methodological innovator as well. Students' interaction greatly depends on the type of activities and so material design is one of the main roles of a content teacher.

What students gain from CLIL

According to Taillefer (2013), CLIL develops the four skills; receptive and productive alike. During the semester, students will be able to process and "*critically evaluate information in the field of study"* (Taileffer, 2013:34). Students will be able to use not only their mother tongue but also the FL to meet communicational expectations in professional settings. Their oral and writing skills – in this particular case, the research writing skills – in the FL will evolve and meet the requirements of professional and also social contexts. Another valuable asset students achieve is the ability to deploy *"appropriate metacognitive skills and strategies"* (Taileffer, 2013:34).

Methods and materials

The course Scientific Writing in English at Semmelweis University was set off in 2019. The course aimed at presenting students with a genre-specific professional language of scientific publications, which they can use to write their scientific articles. Our syllabus includes the know-how of writing different sections of scientific publications. Students also learn about and practice the linguistic tools that should be employed in different sections of an article. The course is one semester long, which is 14 weeks, 90 minutes a week.

PhD and TDK (Students' Scientific Association) students attend the course but there is no limitation as to what year they should attend. Students' native language is usually Hungarian (about 85%) but other language speakers (e.g. Chinese, German, Polish, among others) attend as well. The level of their English knowledge is usually above B2, and many of them have a C1 language exam. Each course is set off with a maximum of 20 students, which number is always achieved.

The input requirements of the course are a minimum of a B2 level command of English, and some experience with scientific article writing (i.e. Diploma thesis for PhD students or research projects for TDK students). The output requirements are that students need to have one section of their article written by the end of the course and continuous interactive presence during the following seminars.

The material had been prepared for two years and in the first semester of the 2021/22 academic year a feedback form was filled in by the students, reflecting upon their experiences. The CLIL methodology was used during the preparation of the material. All four skills (receptive and productive) were engaged. However, the main focus was on building material that actively involves student participation, supports cooperation and makes students use the FL to perform the activities introducing the content so that a deeper knowledge of the content is achieved. During the preparation of the material, the revised Bloom's taxonomy was used. Its 6 levels from LOTS towards HOTS were employed in the activities. This article aims to demonstrate all six levels within the sample activities taken from the course material. At the end of the course, students filled in a feedback form where they had to comment on how they felt during the course, what they thought about the activities and what recommendations they had for the further improvement of the course material.

Results

The revised Bloom's taxonomy in our CLIL material

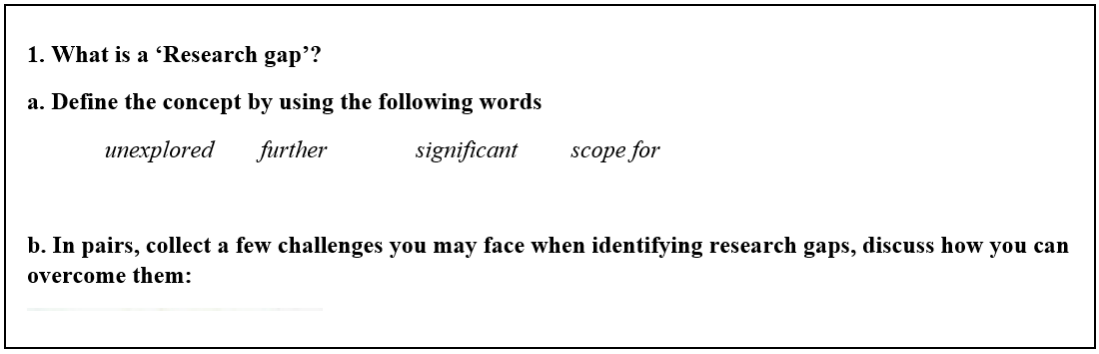
Our aim was to use the revised Bloom's Taxonomy as the educational framework of the Scientific Writing course, which enabled our material to be improving skills of different levels of complexity. These levels built into tasks in each lesson helped us design effective instructional strategies and assessments, which are demonstrated in this section.

Activities and level 1 cognitive processes: Remember

When discussing the types of activities in the Scientific Writing in English course, the beginning of the lesson is based on the first level of the revised taxonomy, which is remembering. The cognitive process of remembering is one of the LOTS. Lessons begin with an introductory phase of recalling actions, topics, concepts having occurred in the previous lesson or that are related to the new topic.

Some of the typical activities may be defining, stating, identifying the new topic, which may be introduced by eliciting the opinions or experiences of students. As an example, in Figure 2, the teacher asks about what a 'research gap' is then students define it by using the given words. Interactivity sets in and the task becomes more complex when students are required to collect challenges in pairs. Task 1b requires them to share their previous experiences and opinions with each other thus promoting a deeper understanding of the concept is Task 1a.

Figure 2. Sample activity for Level 1: Remember

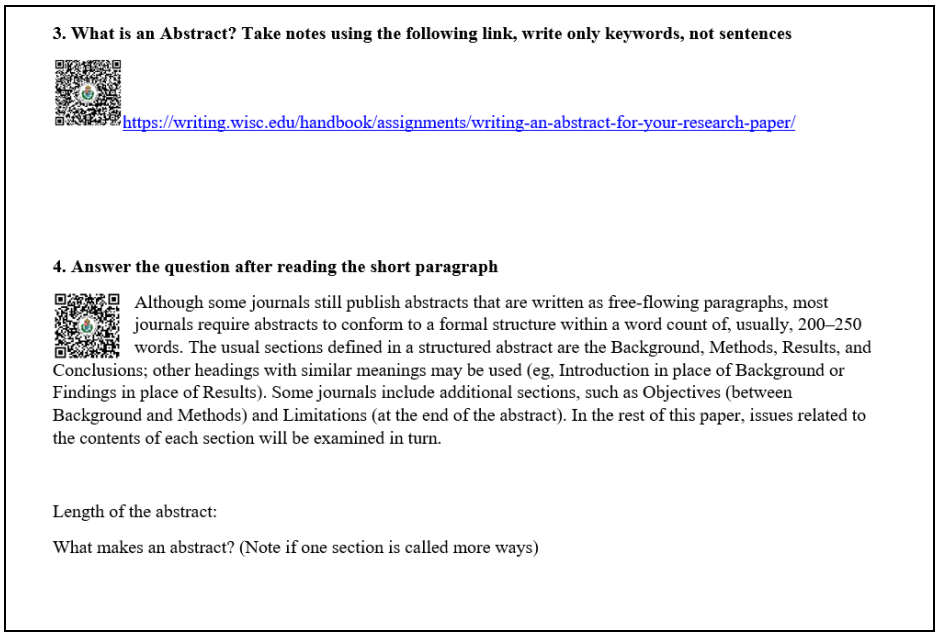


Activities and level 2 cognitive processes: Understand

The second level of cognitive processes is understanding. Activities facilitating understanding include association, comparison, categorizing, relating and summarizing among others. These types of activities still employ the LOTS. This level requires students to focus on a written, oral or graphic input and if the input is appropriate, students will be able to understand it.

An example of this process is when a given text about a particular subject needs to be summarized or specific details need to be elicited from the text (see Figure 3). Students receive a link where they can find information about the concept of an abstract. They then need to take notes, which should not be in sentences but rather in keywords as they need to be able to read a text to get its essence. After understanding the concept of an abstract, they read a text about it and then answer questions.

Figure 3. Sample activity for level 2: Understand



Activities and level 3 cognitive processes: Apply

The third level in Bloom's revised taxonomy is the process of application, that is using information previously gained in new situations. This level involves sketching, choosing, implementing, integrating, and presenting the gained knowledge among others. This skill is not an automatic process but a more complex one so it may be somewhere between LOTS and HOTS. It may involve the previous two levels as remembering and analysing information is an essence before students can apply it.

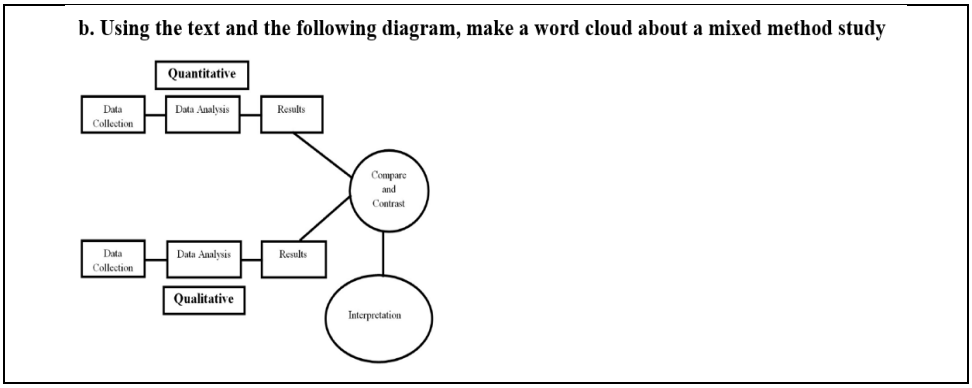
In our material, after studying what exactly the IMRaD structure entails, students are given a humorous and simplified version of an article written in IMRaD (see Appendix 1). Students are asked to create a similarly short but humorous article about a topic of their choice (see Appendix 2).

Activities and level 4 cognitive processes: Analyze

Level 4 of the cognitive processes is analyzing. This skill is one of the HOTS. If knowledge is not just applied but also organized, linked, questioned, structured and so on, students are then able to use a higher level of thinking processes.

In our PhD course Scientific Writing in English, mind maps and word clouds are typical examples of such a creative and analytical way of creating. In our example (Figure 6), by using a given text and a concept map, students have to create a word cloud about a particular topic.

Figure 6. Sample activity for level 4: Analyze



Activities and level 5 cognitive processes: Evaluate

When students get to a point when they can evaluate the set of data or information they have received during the lesson, they are already using high order thinking skills, which is the fifth level of Bloom's taxonomy. Exercises based on detection, reflection, evaluation, prediction, review etc. are the ones that can engage this particular thinking process.

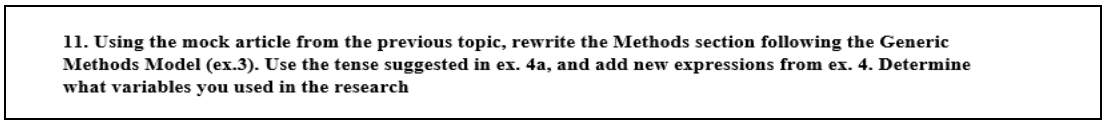
In our material, bullet points about a topic to be considered are listed. Each point needs to be evaluated by students to assess how much truth value the points have when it comes to the topic discussed (see Appendix: *Figure 7*). Evaluation in this activity involves the understanding of the given data, its application to the particular topic and a deeper knowledge as to how relevant that data is to the topic.

Activities and level 6 cognitive processes: Create

Upon the receipt of all information needed for the digestion of the content of the lesson within a particular topic, the material focuses on the highest-order thinking skill within Bloom's revised taxonomy. When all necessary information is available after the previous 5 processes, level 6 is a challenging skill as it is very complex and needs thorough preparation which leads to this last step.

In our sample exercise, the previous topic from the last lesson is involved as well. Students are required to create a section using the data created in the last lesson, the model taught during this lesson, and the tenses discussed in a previous exercise and once completed, they will assess their end product to find particular information in it. This exercise is a typical end-of-lesson CLIL consolidation.

Figure 8. Sample activity for level 6: Create



Discussion

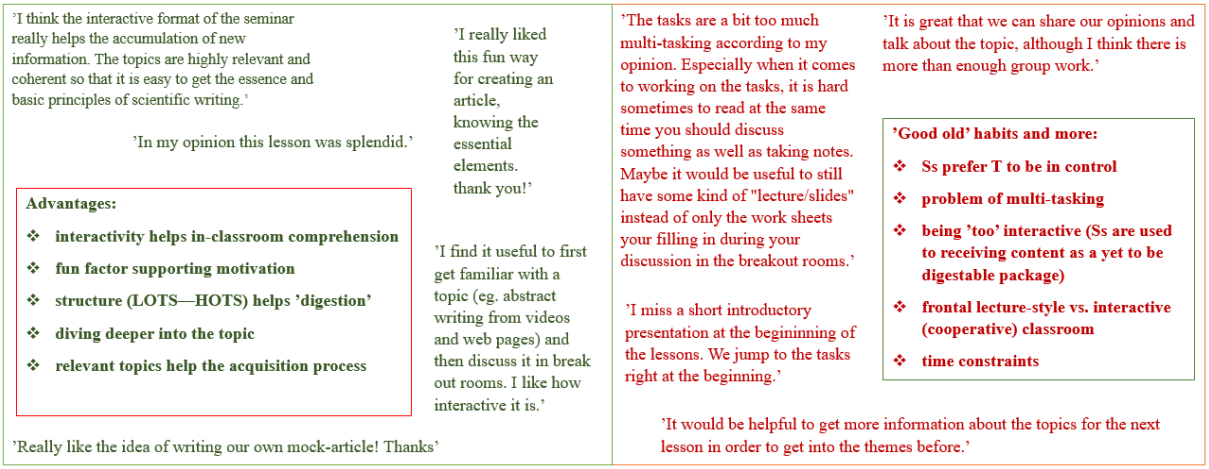
Developing material for the tertiary CLIL course Scientific Writing in English was challenging as the relevant literature hardly demonstrates typical CLIL tasks in any tertiary topics. Most recommendations concentrate on primary and secondary education (Kovács, 2014) and content–language material in these two sections. Research on CLIL supported, however, the efforts of creating the material. The use of LOTS and HOTS (Marsh, 2013) and Bloom's revised taxonomy (Anderson et al., 2001) provided valuable guidelines in the creation of interactive, authentic and inspiring content courses in the tertiary sector as well.

Our course, Scientific Writing in English was developed by using the information available with CLIL. Lessons were created on the basis of the revised Bloom's taxonomy (Bloom, 1956). Tasks followed the six levels of the cognitive processes (Anderson et al., 2001), starting from the lower, and building up towards the higher-order thinking skills.

CLIL in our Scientific Writing in English course has been an effective tool for setting up an interactive atmosphere to aid deeper learning (Marsh et al., 2012) and natural, authentic language use. The use of the methodology makes the course teacher become the facilitator (Taileffer, 2013) of the know-how of writing articles. The teacher also provides students with appropriate language input that improves PhD and TDK students' language while the activities deepen content knowledge (Swain, 1993). Students use the highest level thinking skill at the end of the lesson for consolidation.

The success of the material is signalled by student feedback (see Figure 9). The advantages students reflected on were that interactivity helps in-classroom comprehension, and the fun factor of the lessons supported their motivation. As known from the literature, *"summarization provides a significant contribution to students in understanding information and transferring it to long-term memory, as well as improving memory and understanding by ensuring effective use of mental skills*" (Özdemir, 2018: 2199). Their reflection upon the in-classroom comprehension refers to their summarization skills used for consolidation at the end of each lesson. They also said that the structure (i.e. LOTS to HOTS) helped the 'digestion' of the content and made them dive deeper into the topic. In conclusion, the relevant topics and the structure help students' acquisition process.

Figure 9. Some examples of students' feedback



However, students called our attention to some limitations as well. Students prefer to be in control over the learning process and some of them found multi-tasking to be difficult when solving tasks in a group. Some reported on the classes to have been too interactive, which may mean that they are more used to receiving content as a package to be digested after or before

the lesson, which might be due to previous frontal-style lessons in their education history. This is an interesting phenomenon and little focus has been put on the mapping of how many schools still teach in a frontal style or have shifted towards a more interactive, cooperative, student-focused teaching style.

Conclusion

Applying the research behind CLIL to our course Scientific Writing in English, further recommendations can be made as to what direction our tertiary CLIL material should take. Taking students' feedback into consideration on how they feel in the classroom, what they gain out of CLIL lessons and what limitations they have in the classroom dealing with interactions help us understand PhD and TDK students' needs within the topic of Scientific Writing.

As a next step, a new course with the support of short educational videos is being developed to help our students write their theses at the end of their PhD studies. The methodology will be the same, the material will be developed by using CLIL. It will be investigated whether our methods suffice when it comes to the preparation of theses.

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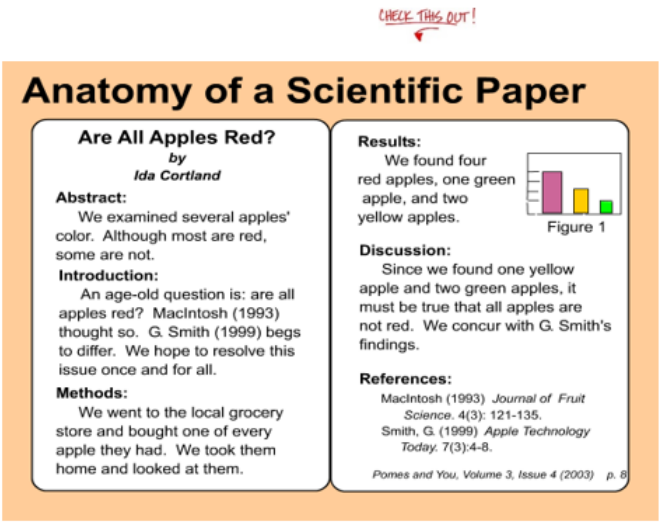
Appendix

Appendix 1. Sample activity for level 3: Apply
(figure adapted from the website https://libguides.library.vcsu.edu/biol150/scholarlyarticles)

8. Groupwork: write a similar mock-paper on a topic of your choice.



The Mock-Paper:

Appendix 2. Example for how students performed *Figure 4* Sample Activity

Is the Milky Way really milky?

Jobbágy & Kovácsházi et al.

Abstract: Milky Way is called milky since the Greeks. But is it really? We measured the absorbance of the Milky Way and milk in a vacuum. Our results show the Milky Way is not so milky.

Introduction:

Greeks may have thought that the Milky Way is just one, single, white band in the sky. It was Galileo Galilei who showed that the Milky Way is made of independent stars. (Galilei et al. 1610) By now, we know that the Milky Way is just one of the many galaxies. (Shapley & Curtis et al. 1921) However, it is still not known if it is really composed of milk. Our aim is to find out how much milk the Milky Way contains.

Methods:

The light absorbance and emission spectrum of the Milky Way and milk in a vacuum was measured.

Results:

Our results show that the Milky Way has a far more different absorbance and emission spectrum compared to milk.

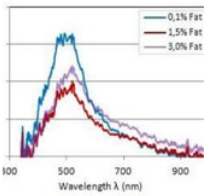


Figure 1.: Light absorbance of milk with different fat containment.

Discussion:

(Connect introduction and discussion) Our results show that the Milky Way is not made of milk. However, it is still unknown if it is made of chocolate. Measurements in space are also recommended for further evidence.

Reference:

Galilei et al. (1610) „My thoughts about the Universe" Notebook of Galilei vol 3., pp. 4-15. Shapley, H.; Curtis, H. D. (1921). "The Scale of the Universe". Bulletin of the National Research Council. 2 (11): 171–217.

Appendix 3. Sample activity for level 5: Evaluate (adapted from Glasman-Deal, 2020)

3. Discuss whether the following points are valid when writing your Results section

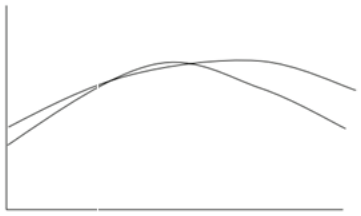
Narrative guidance for Results is needed because <u>the direction of the results may be unclear</u>

- readers look for trends and patterns in the results
- if the Results are listed in the order they occurred, readers have to adjust the trends and patterns found to see the direction the writer goes
- different readers may see different patterns in the data which may drive them away from your interpretation
- the writer should organize and present the results within a narrative that structures them optimally
- a well defined structure leads the reader towards the writer's interpretations and conclusions

4. Check the Figure and describe it.

What are the curves like?

As can be seen in Fig. 3.1, the two curves are……..



5. Evaluative language

a. Collect expressions that refer to tbe following concepts

Invitation to view Results:

Specific / Key Results:

Objective descriptions of results: