

# Teachers' opinions on which information is important to decide on the use of an educational website

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*Research paper Science Education and Communication*

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maart '15

## **Abstract**

Websites are a common resource for education nowadays. The offer of websites, however, is so large that teachers lack time to screen the websites for usefulness. Websites remain unused even though they are of good use to add context to the concepts for students and they can orientate students on beta careers. Since teachers are the main link between students and (educational) websites, this research focusses on teachers' opinions on which information is important to decide on the use of an educational website. The results of a survey and interviews with teachers on general preferences, preferences concerning the case study website Food Galaxy and preferences concerning created material can inform website builders on how to communicate the use of their website best to teachers so they can choose their websites fast and properly.

## **Introduction**

Since 2002 99 percent of public (western) schools have access to the internet (NCES, 2003). High schools and universities use the internet to create websites that inform their students about their classes, schedules and general information. Besides this general use of the internet by schools, teachers use the internet as a source of information for their lessons. Several websites can be used to watch educational movies on for example Youtube. Dutch biology teachers highly appreciate educational websites such as bioplek.org and biologiepagina.nl that provide animated videos and/or exercises for students. With the large increase in the use of websites for education it makes sense that developers of material for education created educational websites as well. However, because of the large amount of websites teachers have no time to look them all up and choose the most useful website for their purpose. Entering your search at Google results in so many hits that you do not know the difference between the hits nor which one to use (Henry, 2006). As a result, most teachers only use already familiar websites. Lesser known websites with great educational potential remain unused.

The fact that teachers cannot invest sufficient time to evaluate the educational use of the large offer of websites causes potential valuable sources to remain unseen. This is a problem because websites have the opportunity to connect school material to realistic contexts (Overbeek, 2013) and with the upcoming importance of the concept-context approach this is exactly what the current education needs (CVBO, 2013). Furthermore, websites can orientate students on beta careers. In the Netherlands there is a shortage in students choosing for beta educations- and careers (Taconis, 2009) and it is therefore important that websites stimulate students into a beta education.

Teachers are an important link in the use of websites, both in designing website related exercises and in their role in education- and career choice (de Weerd, 2012). The large offer of websites and the short amount of available time of teachers asks for a tool to search and find qualitative good websites. A possible solution is to adjust the way websites inform teachers about what they have to offer. However, it is still unknown what kind of information teachers find important in deciding to use an educational website and in what form. This research aims to answer these questions. The results can inform website builders and administrators (and mediators such as Ecent and bioplek.org) on how to communicate the use of their website to teachers effectively. Herewith, teachers would be helped with their selection process leading to more websites of good quality being used in education. Though this counts for all subjects in education, this research will restrain itself to biology.

## Theoretical background

### Concept-context approach

The growing interest in offering science education with realistic and relevant situations resulted in a concept-context approach. This approach assumes that biological knowledge (concepts) always will be used in specific contexts. If the biological knowledge is used in a contemporary context, whether an everyday life, professional or scientific context, it is likely that we are dealing with biological knowledge which is not only perceived as relevant by students but also will be regarded as relevant by the society (CVBO, 2010).

Features of the concept-context approach are that contexts are defined as authentic practices, in which participants practice activities that lead to the realization of relevant objectives; biological knowledge (concepts) is used in authentic contexts, because it is functional for the realization of the objectives; meanings of concepts are determined in a greater or lesser extent by the practice where they are applied and apart from practices these concepts are meaningless (CVBO, 2010). The addition of “context” to be used as the basis for problems that have to be solved, should increase the challenge for students (Gilbert, 2007). Concerning biology education these features imply that students must be able to handle concepts in (for them) relevant contexts and must learn to adjust meanings of concepts to the context in which they are used. The concept-context approach will play a central role in the new biology approach in Dutch high schools. Future examination candidates (for Pre-University education this will be examined first in 2016 and for senior general secondary education in 2015) have to be able to apply biological concepts within a context. Contexts can be chosen within eight societal themes sustainability, energy, health,

healthcare, sports, safety, nutrition and food production (College voor Examens, 2012). This research explores how teachers can be informed about the connection of the website to the Biology examination syllabus and whether teachers find this important.

### Education and career choice of students

Previous studies have shown that the degree of interest in a subject plays a major role in the study choice of students (Malgwi et al, 2010). The essence of holding interest lies in finding variables that empower students (Mitchell, 1993). This involves increasing the meaningfulness of the concept to the students in such a way that it feels it contributes to reaching their personal goal. Furthermore empowerment can be obtained by increasing the challenge for students (Boggiano et al, 1988). Empowerment can be seen as an increased intrinsic motivation (Thomas & Velthouse, 1990). It consists of the sense of impact, competence, meaningfulness and autonomy. The sense of impact concerns the feeling that the performance of a task is seen as something that matters instead of just something you have to do to obtain a grade, or simply be busy, competence in the sense that students feel capable (e.g. qualified) to perform the activities to reach the goal and meaningfulness concerns the degree of which students perceive a task or content as personal meaningful and important, autonomy in the sense that students recognize themselves in (e.g. feel connected to) the concept (Gagne, 1997). This theory supports the idea of the concept-context approach, where students have to solve more realistic problems (e.g. more challenging and more meaningful problems) in order to gain more insight and better learning results.

Impact, meaningfulness, competence and autonomy of the concept are influenced by internal factors as well as environmental factors. Environmental factors, therefore, play an important role in career choice as well. The most important environmental factors are social and educational factors, which are somehow connected to each other. Examples of social factors are family, classmates and teachers (Eccles, 2007; Frenzel et al., 2010; Sjaastad, 2012; Vedder-Weiss & Fortus, 2013). Teachers can be seen as social as well as educational factors. Teachers can influence students' interest by showing the meaningfulness of concepts to them and providing students with (positive) experiences with the concept (Sjaastad, 2012). Furthermore, the behavior of teachers plays an important role in students' motivation and the interest in that subject (Skinner, 1993). Teachers can influence students by how they approach them. This approach can make students feel capable or incapable of performing a beta subject (de Weerd, 2012). As for the social factors, family, especially close family members such as the parents, act as role models and their expectations from their children as well as their own interests can influence their children's' interest (Frenzel et al, 2010). This research examines whether teachers think specific information on careers on a website is important.

## **Factors influencing teachers in their choices of extracurricular material**

Earlier studies on the use of websites by teachers have shown that teachers are more willing to use websites if there is access to the resources, the quality of software and hardware is good, the website is easy to use and if they are incentive to change, support and collegiality in their school. Besides that, teachers need to be committed to professional learning and need to have a background in formal computer training (Mumtaz, 2000). Furthermore, teachers are more willing to use websites recommended by colleagues (Somekh, 2008) and it is important that it is clear to teachers why the website fits the exam requirements and therefore to know why they need to use a certain website instead of another (Mumtaz, 2000). Most teachers prefer an informational and up to date website, preferably with references to other (connected) sources (Overbeek, 2013). All of these factors are examined in this research and it will be explored whether teachers find the offer of directly usable material important.

## **Educational properties of websites**

The use of websites in the classroom serves several purposes, among which making the lessons more interesting and easier (Cox, 1999). The lessons become more diverse, enjoyable and most of all more motivating for students. The internet has so many opportunities, not just pictures to image the theory, but also videos and extra practice materials to maintain the attention of the students during the entire lesson. Except for serving purposes to make the lessons more fun for students, teachers advantage from the use of websites as well. They do not only have the opportunity to use material directly instead of making their own materials, but they can use websites to improve the presentation of the materials as well (Cox, 1999). For example, it is difficult to draw the blood flow through the veins and heart on the white board realistically. Using an image or video from the internet provides more possibilities to show the students how the blood flow actually works. Summarised, the web can act as an information provider, a communication facilitator, support of creation environment, a teacher resource-center and an instruction supplier (Nachmias, 1998). This research explores which educational properties of websites teachers find important and whether or not an educational website should meet these properties.

## **Communicative properties of websites**

Many research has been done into the communicative properties of websites in order to make them user-friendly. Nielsen and Loranger (2006) named several important assessment criteria for websites concerning content, structure and presentation. For the content a few criteria were: content should connect well with knowledge and interest of user; the home page should mention 'who' the sender is, 'what' the website is about and 'what it aims for'; keep it simple and to the point; do not only inform but also give analysis and insight; start with the most important information (inverted pyramid). For the structure important criteria mentioned were: the navigation bar should always be consistent; avoid scrolling (in case of a long text, use different parts); do not give new information in a new window, but click through to new information in your site; link and headings should give clear direction; link

results from search pages to the content and not to the homepage of the relevant site. Concerning the presentation of the website important criteria were: keep your site uniform; keep the amount of moving elements to a minimum (do not entertain, but inform); use high contrast for the layout. According to Moustakis et al (2004) there are nine main criteria for website to keep in mind: relevance, usefulness, reliability, specialization, architecture, navigability, efficiency, layout and animation. This research explores which of these criteria teachers find important and whether or not a website should meet them.

## Research question

The main goal of this research is to facilitate the website search for teachers by informing website builders and administrators on how to communicate the use of their website to teachers effectively.

In order to achieve this goal, the following research question has been formulated:

### **How can Biology teachers be informed about the educational potential of websites in a way that facilitates the active use of students?**

To answer this question two sub questions have to be answered first:

1. In what way can the content of the website be linked to the Dutch Biology examination requirements in order to inform teachers on the possible use?
2. How can a website provide optimal insight in the possible use of the website in order to inform biology teachers?

## Methods

This research concerns a case study. As case-study a website, FoodGalaxy, is used that has the potential to offer useable resources for biology teaching according to the concept-context approach and material for career orientation. The materials developed for this website are based on a general format for informing teachers on the educational use of a website. By testing the effectivity of the materials for this website, the format is tested as well.

## FoodGalaxy

This research uses the website FoodGalaxy.org as a case study. The website is an initiative of TrackFast: Training Requirements and Careers for Knowledge-based Food Science and Technology in Europe. The TrackFast-project is coordinated by Prof. Christina L.M. Silva of the Universidade Católica Portuguesa – Escola Superior de Biotecnologia and involves 27 partners from 16 countries. The project began in September 2009 and has been recently extended. The aim of the project is “Identification of the training and career requirements of future European food scientists and technologists (FST), and implementation of a European strategy to recruit the next generation FST leaders” (TrackFast, 2009). They want to achieve this goal by identification and definition of personal skills requirements in food job market, developments for the regulation of food science and technology professions in Europe,

establishment of a framework for continual professional training and career development for the FST professional and motivation of young people to enter and pursue of a career in food science and technology in Europe (FoodGalaxy.org).

### **Importance FoodGalaxy**

The importance of this website lays in the importance of the food industry itself; it is the largest industry in the world which causes a great need for food technologists. All people need food and without food technology much less than half of the world population can be fed. Food technology can be used to create new food sources (Alvarez et al, 1992).

Furthermore, food technology is necessary for remaining the safety of food, the transport of food and the preservation of food. Unfortunately, interest in careers in food science and technology is very low, so that the food branch has a problem finding qualified food scientists (Trackfast, 2013).

### **Goal of the website**

FoodGalaxy shows all kinds of possibilities and branches of food technology. The organization behind the website, Track Fast, is aware of the lack of food scientists and technologists in the world and wants to increase this amount of specialists. In order to reach this goal they try to increase the interest in food technology among students of approximately 12 till 18 years old in the hope that they will choose an education towards food technology. However, for most students food technology is an unknown branch and therefore not a very attractive one.

If the website succeeds, the food branch will have less trouble finding qualified food scientists and technologists in the nearby future.

### **Previous studies**

Research by the website itself states that visitors of the website are enthusiastic and more motivated into choosing a beta education, however, their target group is hardly reached.

### **The research**

This research asks teachers in general about their requirements concerning websites and what factors influence their choices.

Furthermore, this research specifically examines to what extent the factors

- Connection of the website to the exam program according to the concept-context approach
- The orientation on beta careers by the website
- The offering of directly useable material

contribute to the judgment of teachers concerning their choice of websites.

Different methods are used to answer the two sub questions.

### *In what way can the content of the website be linked to the Dutch Biology examination requirements in order to inform teachers on the possible use?*

To answer which arguments can be derived to use the website the content of the website has to be compared with the school exam requirements concerning food technology; the Dutch requirements will be examined by document analysis of the syllabus (senior general secondary education exam 2015 and Pre-University exam 2016) and the publication “Naar actueel, relevant en samenhangend biologietoelichting”, which contains the report from the committee responsible for the development of the new exam program for secondary school Biology. The obtained information can be compared to what the website FoodGalaxy has to offer; every part (all the information of the different subheadings) of the website will be compared with the contexts mentioned by the syllabus. If the website matches a context of the syllabus, that website part will be checked on the different concepts it treats and which of those concepts match with the concepts mentioned by the syllabus. Furthermore there will be looked in what way the concepts are treated. These comparisons will provide us the following information:

- a. information on the syllabus concepts illustrated on the website
- b. information on the syllabus contexts illustrated on the website
- c. information on the career possibilities illustrated by the website

By comparing the examination concepts and contexts with the content of the website this study aims to find the connection between the website and the exam requirements. A format will be tested to present this information to teachers to test whether they find this presentation of the link between the exam requirements and the website useful.

### *How can a website provide optimal insight in the possible use of the website in order to inform biology teachers?*

Besides the information about the link between the examination requirements and the website another part of this research is to investigate what factors influence teachers in their website choice. Therefore a questionnaire will be used containing general questions about their demands (see appendix 2). Secondly, products will be developed (based on examined literature) to find out if material that can be used directly from the websites helps them in deciding to use the website and if so, what kind of materials. Finally, website specific questions will be asked, for example how they would like to be informed about the link between the website and the exam requirements and what the website should improve in order to become more attractive. The questionnaire will contain mostly closed questions with a Likert scale and will further exist of a few open questions to add optional notes.

To obtain more insight in the reasoning behind the answers of the teachers, biology teachers will be interviewed (semi-structured). With this interview the interviewer can obtain more detailed information about the thoughts behind the answers and the demands of biology teachers concerning educational websites.

With the data of the literature analysis, questionnaire and interviews this study aims to find

the factors that influence teachers' choice on educational websites and their preferences concerning offered materials.

### **Questionnaire**

The questionnaires are used to find out teachers' demands for educational websites in order to use them in their lessons. Participants fill in the questionnaires online and the program Google Documents sorts out all the answers per participant. Teachers are approached by E-mail. Familiar biology teachers to the researcher have been asked to send the questionnaire forward to other biology teachers. This resulted in 13 participants, dispersed through the middle of the Netherlands and with different experiences (varies from one year of experience to dozens of experience).

### **Interviews**

Based on the questionnaires about general use of extracurricular material during their lessons and the specific questions about the website FoodGalaxy.org and the designed material, teachers will be selected for semi-structured interviews. Selection ensures that only teachers with a clear opinion will be interviewed and teachers with different opinions can clarify themselves, in order to create a general advice towards website builders. To make sure that topics and questions that matter will be addressed during the interviews a topic list will be used (Boeije, 2010), based on the data resulting from the literature analysis and questionnaires.

### **Data analysis**

The data analysis consists of the questionnaire data and the interview data. The questionnaires of the several teachers will be compared to each other and every question (e.g. demand) will be given a number of importance. This number of importance is calculated by the percentage of occurrence of an answer in the scale bar. The interviews will be analyzed by comparing the answers of the interviewees and see whether or not they overlap and why.

## **Results**

**In what way can the content of the website be linked to the Dutch Biology examination requirements in order to inform teachers on the possible use?**



## Examination requirements

By comparing the introducing text of the CVBO program with the future exams and the exam requirements the following indications of biology education should be taken into account. Biology education should concern modern biology and be relevant for the personal and social education.


Additionally, biology education should challenge students to opt for an education in biology. Changes in the education program enable students to handle personal choices better and provide students an improved perspective of the social issues that cannot be solved without biological knowledge. The important subjects (nutrition, health and sustainability) should be treated professionally (e.g. with real life practices). Nutrition and food security are becoming more important topics in social issues (CVBO, 2010). After all, we

need food for billions inhabitants of the Earth. Sustainable agriculture and food production are just some of the many challenges for the future. Biology education reaches every student and should focus on providing the elementary biological knowledge needed for the making of decisions concerning civilian positions and choices. We are already seeing an increasing demand for employees in the field of functional food production and agriculture also makes a spectacular innovation by breeding and energy-producing greenhouses, and closed food production systems.

### Immersion makes rice varieties 'waterproof'

It's just a simple gene, but one that prevents billions of people from starvation. The immerse-gene enables rice to endure prolonged floods.

Rice is a semi-aquatic plant species (Figure 1), but it appears almost as sensitive to immersion as many land plants. Plant breeder David Mackill of the International Rice Research Institute has managed to cross the immerse-gene Sub1A from a low productive Indian rice in commonly used rice varieties. Since there is no question of transgenic plants extensive field tests are unnecessary.



**Figure 1**

- The traditional way of introgression of a gene in a plant differs from the modern way to create a transgenic plant with the use of genetic modification.
- 3p 1 Describe in three steps the process of traditional introgression of the immerse-gene in rice plants.
- 3p 2 Describe in three steps how genetic modification can enable rice plants to endure long-term flooding.

The field trials required for new plants, are needed to examine whether the product contains the new feature, and no other important features are lost. But also, especially for transgenic crops, to exclude certain negative effects of these plants on the environment.

- The new feature of the immersed-rice is the withstanding of prolonged flooding.
- 2p 3 Write down two features, important to obtain a high yield, of these rice plants that should not be lost.
- 2p 4 Describe two possible negative effects of a genetically modified rice variety on the environment that may result from the field trials.

**Figure 1:** Example of a Dutch biology exercise

Scientific contexts mostly lead to a higher level than professional- or environmental contexts. The concept-context approach assumes that biological knowledge (concepts) always will be used in specific contexts. If the biological knowledge is used in a contemporary context, whether an environmental, professional or scientific context, it is likely that we are dealing with temporal biology, which is not only perceived as relevant by students but also will be regarded as relevant by the society (CVBO, 2010). Figure 1 shows an example of an exercise from the Dutch biology exam VWO 2014 (first time-area) concerning food technology to modify rice plants.

### Information on syllabus concepts illustrated on the website

For the Senior General Secondary Education especially concepts in the everyday life contexts are chosen to socially equip the students, and concepts that are used in the main professional practice for which a further education is required. For the Pre-University program concepts in the social world contexts are chosen to socially equip the students, and especially concepts that are used in scientific research done at universities, research institutions and companies in the Netherlands (CVBO, 2010). The concepts as defined by the syllabus are: DNA, protein synthesis, homeostasis, transport, assimilation, dissimilation, organ, photosynthesis, respiration, digestion, excretion, hormonal regulation, neural regulation, (immunological) defense, processes of gene expression, cell differentiation, life cycle, gene regulation and interaction with (a-) biotic factors, food relationship and interaction with (a-)biotic factors, DNA replication, cell cycle, reproduction, genetic trait, mutation, recombination and variation (see appendix 1). The website FoodGalaxy covers only some of those concepts that have anything to do with food (see table 1).

| Concepts as mentioned by the syllabus | Concepts covered by FoodGalaxy  |
|---------------------------------------|---|
| Defense                               | The website shows among others how different types of food help your body with its defense (see subheading 'food and health') and it shows how your body reacts to types of food in case of an allergy (see subheading 'allergies and intolerances'). |
| Digestion                             | The website shows for different types of food and drinks how they are made and how some of the ingredients act on the intestinal tract (see heading 'A small product for the consumer – a giant process for the producer').                           |
| DNA                                   | The website shows how DNA of different food species is modified in order to obtain "better" food (see subheading 'GMO').  |
| Life cycle                            | The website shows how food influences among others human weight and age (see heading 'I eat therefore I am').   |
| Neural regulation                     | The website shows how food influences the brain, for example on the human mood (see subheading 'Food and brain').   |
| Transport                             | The website shows how food is digested and how several substances are spread throughout the body and the consequences of an overload of substances remain in the body   |

|                                       |
|---------------------------------------|
| (see heading 'I eat therefore I am'). |
|---------------------------------------|

**Table 1:** connection of FoodGalaxy with some concepts as mentioned by the Syllabus

### Information on syllabus contexts illustrated on the website

In the learning outcomes of the examination program a contextual component is included. Within the eight context-themes a great variety of scientific contexts, professional contexts and environmental contexts can be chosen. An important theme is nutrition (food), which concerns the availability of food by which biological units, from cells to ecosystems, can sustain themselves and develop, and the food supply by optimization of growth and development of biological units that can be used as food by humans (CVBO, 2010). Table 2 provides an overview of the themes as mentioned by the syllabus and which of them the website FoodGalaxy covers.

| Context themes as mentioned by the syllabus | Context themes covered by FoodGalaxy  |
|---|---|
| Sustainability                              | Information on sustainable growing of food (see heading "Sustainability") and information on the general sustainable dealing with food (see heading "Mission Impossible")                     |
| Energy                                      | This theme is not explicitly covered by FoodGalaxy  |
| Health                                      | Information on the influence of food on health (see heading "Food and Health")  |
| Healthcare                                  | Information on bacteria in food (see heading "Microorganisms"), allergies and belonging symptoms, diagnoses and solutions (see heading "Allergies and intolerances")                          |
| Sports                                      | Information on the influence of food on the brain and therefore on brain-stimulated (sport)activities (see heading "Food and Sport")  |
| Safety                                      | Information on what is safe and what is not safe concerning food (see heading "To eat and not to eat")  |
| Nutrition                                   | Information on different food products (see heading "A small product for the consumer – a giant process for the producer")  |
| Food Production                             | Information on genetic modification (see subheading "GMO"), food production in general, preservation methods (see heading "Once Upon a Time") and transport of food (see heading "packaging") |

**Table 2:** connection of FoodGalaxy with the contexts as mentioned by the Syllabus

### Information on the career possibilities illustrated by the website

The website has a heading 'my food career' with several subheadings that provide you with information about among others the different career possibilities, jobs and internships and how qualified technicians use new methods to solve long unsolved problems. The website also provides visitors with information on emerging technologies to create new food and examples of different upcoming machines, such as a 3D-printer. Additionally, the website

offers several examples of food technology in real life practice, for example the harvesting of tomatoes by farmers. Finally, the website connects to videos from Youtube that provide you with information about how food is connected to the different functions of your body and how you should prepare your food.

## How can a website provide optimal insight in the possible use of the website in order to inform biology teachers?

### Questionnaire

To answer this question a questionnaire has been send out to biology teachers (N=11). This questionnaire contained as well general questions on website demands of teachers concerning what a website should offer (the lay-out of a website is disregarded) as specific questions concerning FoodGalaxy. The average of the results of the questionnaire are summed up in table 3.

The questions that had to be answered by a scale bar are numbered as followed:

0 = Very unimportant / Totally disagree

1 = Unimportant / Disagree

2 = Unimportant nor important / Disagree nor agree

3 = Important / Agree

4 = Very important / Totally agree

Behind the question the number of importance/agreement is given.

| Question   | Nr. of importance |
|--|-------------------|
| <b>General questions on what a website should offer</b>  |                   |
| A website can best be noticed by teachers through:   |                   |
| - On top of google at search results   | 4,0               |
| - Included in school method  | 3,0               |
| - Redirected by other websites   | 3,0               |
| - Other: mouth-by-mouth commercial between teachers  |                   |
| The website contains more information than schoolbooks   | 3,0               |
| The website offers the information differently than schoolbooks                                  | 3,6               |
| The website offers examples of the use of concepts in practice                                   | 3,3               |
| The website offers material that can be used in the lesson                                       | 3,2               |
| The website offers material that can be used directly  | 2,7               |
| The website provides an overview of the connection between the exam requirements and the website | 2,2               |
| The website offers a separate heading for schools  | 2,3               |
| The website interests students in science education  | 2,4               |
| The website is, besides English, available in the own language                                   | 2,7               |
| <i>Comment: the upper classes have no problems with English.</i>                                 |                   |
| <b>Product specific questions</b>  |                   |
| The website offers material that can be used directly  | 2,4               |

|   |     |
|---|-----|
| The offered material should meet the concept-context approach                 | 3,1 |
| The offered material should meet the step-by-step approach                    | 1,9 |
| Product 1 meets the concept-context approach                                  | 2,8 |
| Product 1 is a good example of what kind of materials websites should offer   | 2,5 |
| A website would be more attractive if materials such as product 1 are offered | 2,5 |
| Product 1 interests students in the subject <sup>1</sup>                      | 2,6 |
| Product 2 meets the step-by-step approach                                     | 3,1 |
| Product 2 is a good example of what kind of materials websites should offer   | 2,4 |
| A website would be more attractive if materials such as product 2 are offered | 2,3 |
| Product 2 interests students in the subject <sup>2</sup>                      | 2,0 |

### ***Website specific questions***

|  |     |
|--|-----|
| Product 1 is suitable for orientation of the website   | 2,3 |
| Product 2 is suitable for orientation of the website   | 2,8 |
| The website contains more information than schoolbooks   | 2,9 |
| The website shows career possibilities   | 2,2 |
| The website offers examples of use in practice   | 2,3 |
| The website refers to other sources  | 2,2 |
| The website is attractive  | 3,1 |
| The website shows possibilities to be used in lessons  | 3,0 |
| If the website offers products like product 1 I would want to use it in my lesson  | 2,6 |
| If the website offers products like product 2 I would want to use it in my lesson  | 2,3 |
| Only if the website offers both such products, I would want to use it in my lesson   | 1,0 |
| If the websites shows the agreements with the exam requirements (in a narrative way) I would find the website more attractive to use in my lesson  | 2,0 |
| In such a narrative overview the next parts are important to mention:  |     |
| - List of topics   | 4,0 |
| - Description new technologies   | 0,0 |
| - Description of Career- and education possibilities   | 1,0 |
| - Description of the connections and other features of the website structure   | 3,0 |
| - Other: educational learning goals and details of the website   |     |
| If the website shows the agreements with the exam requirements (in an overview table) I would find the website more attractive to use in my lesson | 2,6 |
| In such a table overview the next parts are important to mention:  |     |
| - Context area's and how the website meets those area's  | 4,0 |
| - Domains with concepts and how the website meets those domains  | 4,0 |
| - The forms in which the subjects are offered by the websites (for example video)  | 1,0 |
| If I had to choose between the narrative overview or an overview table I would   |     |

<sup>1</sup> Comments by the teachers on product 1: Not much context, there is no connection to the target group, the personage is fictional, it increases the interest in the subject, it is a good exam practice, and it is partly step-by-step which keeps the overview clear.

<sup>2</sup> Comments by the teachers on product 2: The separate question numbers are very clear, it lacks contexts (2x), the personage is fictional, it is clear, it is a good way to orientate on the website (2x) and it is a good practice for lower classes.

choose<sup>3</sup>:

|   |     |
|---|-----|
| - Narrative overview  | 0,0 |
| - Table overview  | 4,0 |
| Only if the website is available in Dutch I would use it in my lesson | 1,9 |

Other comments on the website:

- Pretty, but unclear website
- Way of writing should be more popular-scientific
- English is fine for upper classes
- Welcome addition to the school material
- As long as there is enough information on the website I can create my own products
- Product 2 is especially for lower classes
- The concept-context approach should be approached according to the step-by-step approach
- The lay-out of the website make it look like it is a space technology website
- The goals of the website are unclear
- The center of the website is highlighted though there is no click-function for it

**Table 3:** enumeration of the average of the results of the questionnaire

## Interviews

To obtain additional insight in the answers of the questionnaire three biology teachers, two with over a ten years of experience and one with approximately five years' experience, are interviewed. All of them use extracurricular material in their lessons. They were asked to give an explanation of their answers to the questionnaire and they were shown an example of an instrument (see appendix 3) website builders could use in order to increase the attractiveness of their website.

## General questions

The answers to the questions of the general part of the questionnaire were already very clear and the interview did not add much value to it. However, some additional comments on the answers were made by the interviewees.

One teacher noted that she always looks at websites recommended by other teachers and therefore face to face commercial would be a good way to promote a website, but using the internet provides a bigger audience than face to face commercial and would lead to a quicker spreading of the website.

A separate heading for school topics on the website was not necessary. It could be handy, but if the website is clear there would be no problem in finding the right information. One teacher thought it was very important that the website interests students in a scientific education, while the others just needed the website to interest the students in that specific topic they were currently working on.

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<sup>3</sup> Additional notes given by the teachers on this question: The table overview provides a more targeted search (3x), is clearer (6x), is more professional, is faster to read and more handy for the upper classes.

The language, list of exam requirements and directly usable material were not in total agreement. One teacher would only use the website if it was available in the own language, because otherwise a lack of skills in English could hinder the students' learning process for biology (another subject). The other teachers agreed that the lower classes would need the website to be in their own language, while the upper classes could handle the English just fine.

Concerning the list of exam requirements, one teacher thought that it would really speed up the work, while the others thought that it could come in handy, but was not necessary. They would know for themselves what they needed to treat and what concepts and contexts were important. But they would probably look at it if it was available on the website.

The offer of material that can be used directly was highly appreciated by one of the teachers, because it would lower the work amount and it would offer material that was already adjusted to the website and would need no further editing. The other teachers, however, liked making their own materials and then they would know for sure that it would fit their lessons properly and would be of additional value.

### *Product specific questions*

The teachers agreed that the material should meet the concept-context approach. The step-by-step approach is already used in most of the assignments of the school methods and would not have any additional value, except for extra practice. They would therefore all prefer the first product above the second one. However, the product could be sharpened a bit to fit the concept-context approach even better, but in this form they would probably use it as well (or at least look at it and use it for inspiration). They all agreed that it would be good if the website did offer materials that can be used directly, because it will most probably increase the websites' attractiveness even though some teachers will not use the material.

### *Website specific questions*

All teachers agreed on the amount of information given by the website; it provides more information and provides it differently than the school books do. However, the career possibilities were not shown clear enough. They are mentioned under a subheading, but there are much more career options concerning food and they are not mentioned at all, or not clear enough. They also agreed on the way of showing a list of the exam requirements. It should be in a structured table and show the topics the website treats and provide a description of the connections and other features of the website structure. One teacher noted that the website should provide more examples of use in practice. "Its goal is to interest students in a career towards food technology, but the amount of examples is very low, while the website should bulge with examples of use in practice." Furthermore he mentioned that the website lay-out is a bit deceiving; "it looks like a website about space technology, instead of food technology". An extra comment on educational websites in general was that they should be open to comments or tips from users.

### **Instrument example**

All teachers agreed that the instrument would help website builders to increase the attractiveness of their website. Furthermore, it would make it easier for them to build a website, because they can work through a roadmap. One teacher noted that it would, however, still be dependant of how the information is brought to the target group. It should be written in a popular-scientific way if it has to increase the interest of students in the subject. One teacher mentioned that there always should be a contact address for any comments, questions and tips and that the search bar has to be on the upper right side of the website, because people are used to that and it will add to the websites' structure.

### **Conclusion**

To answer the research question, first the two sub questions have to be answered.

#### **In what way can the content of the website be linked to the Dutch Biology examination requirements in order to inform teachers on the possible use?**

The content of a website can be linked to the Dutch Biology examination requirements with an overview table that visualises the domains, concepts and contexts of the examination program mentioned by the website. For example:

| <b>Domains</b>   | <b>Skills as mentioned by the syllabus</b>  | <b>Connection with the website</b>                      |
|------------------|---|---|
| <i>Domain A1</i> | <i>Skills students should have according to the syllabus (using certain concepts in certain contexts)</i> | <i>Connection with the website and where to find it</i> |
| <i>Domain A2</i> | <i>Skills students should have according to the syllabus (using certain concepts in certain contexts)</i> | <i>Connection with the website and where to find it</i> |

| <b>Contexts as mentioned by the syllabus</b> | <b>Connection with the website</b>                                     |
|--|--|
| <i>Context 1</i>                             | <i>Connection with the website and where to find it on the website</i> |
| <i>Context 2</i>                             | <i>Connection with the website and where to find it on the website</i> |

| <b>Concepts as mentioned by the syllabus</b> | <b>Connection with the website</b>                                     |
|--|--|
| <i>Concept 1</i>                             | <i>Connection with the website and where to find it on the website</i> |
| <i>Concept 2</i>                             | <i>Connection with the website and where to find it on the website</i> |



## How can a website provide optimal insight in the possible use of the website in order to inform biology teachers?

The exam program concerning biology has been renewed and focusses on the concept-context approach; as the results show, exam questions are based on realistic situations and problems. Websites can offer context to the concepts by using different materials such as video, animation, sound or examples from practice. Teachers seem to prefer a table overview in which the connection of the website to the exam requirements is given. The overview includes all the requirements: domains, contexts and concepts. This enables teachers to see if the website fits their purpose quickly.

The criterium that a website should interest students in science education seems to be less important to teachers, however, it is important that the website motivates students for the subject and as former research has shown the interest in a subject at school increases the interest in an education towards that subject. A note has been made that if the purpose of the website explicitly is to interest students in a career, it should give many examples from practice.

Concerning the offered material, opinions are divided. If material is offered by the website it is preferred to be directly usable and it has to fit the concept-context approach. However, as long as the website is clear and fits the purpose of the teachers, it enables them to create their own material with use of the website content.

The results show that teachers confirm many website assessment criteria as mentioned by Nielsen and Loranger: a website should provide examples from practice and not just inform; the link and headings should give a clear direction; a website should refer to other websites and sources; the website should be uniform; the goal of the website should be clear.

Additional notes of the interviewees confirmed some criteria of Moustakis that the layout should fit the purpose of the website (which was not the case at foodgalaxy.org) and that the usefulness and efficiency of a website are important.

The results show that the opinions of teachers can be diversified which shows that every teacher has his own way of teaching. However, some main criteria – where all teachers agreed on – on the visibility, approach, career orientation and offered material can be listed to gain the answer to the question how a website can provide optimal insight in the possible use of the website in order to inform biology teachers.

### *Visibility*

A website should be visible when you search at for example Google, furthermore it should be referred to by other websites and refer to other websites itself.

### *Concept-context approach*

A website should indicate whether or not it offers contexts useable for education and/or practices the concept-context approach in its offered material.

### *Career orientation*

A website should indicate whether or not it provides an orientation in an education or career.

### *Offered material*

A website should indicate whether or not it provides material and if so if they provide either directly useable material, or provide information which can be used in educational materials.

With the answers of the sub questions the research question can be answered.

## How can Biology teachers be informed about the educational potential of websites in a way that facilitates the active use of students?

Biology teachers can be informed about the educational potential of websites by a short information online (for example at your Google hits) that states whether or not the website:

- Fits the concept-context approach
- Offers career orientation
- Provide material either directly usable, or information to create material
- Provides a table overview with the connection of the website and exam requirements

Furthermore, the website should be attractive to students by the writing style, animations and chosen contexts in order to facilitate active use of students.

### Advice

The results of this research can provide an advice for website builders and administrators on how to increase the attractiveness of their website for teachers. This advice consists of the following steps:

#### Steps to increase the attractiveness of an educational website

1. Provide more information than the regular school books do
2. Keep your target group in mind while writing the information on the website; it will mostly ask for popular-scientific writing.
2. Provide examples of use in practice
3. Use a clear structure  
*Leave standard positions, such as the search bar in the upper right corner, at their position*
4. Make sure the lay out fits the purpose of the website
5. Provide several materials that can be used directly in lessons and fit the concept-context approach
6. Make sure the website is not just available in English, but also in the mother language of the country the website is meant for
7. Provide an overview of the connection between the exam requirements and what the website has to offer. Use a structured table and mention domains, concepts and contexts as mentioned by the syllabus. For example:

| <b>Domains</b>   | <b>Skills as mentioned by the syllabus</b>  | <b>Connection with the website</b>                      |
|------------------|---|---|
| <i>Domain A1</i> | <i>Skills students should have according to the syllabus (using certain concepts in certain contexts)</i> | <i>Connection with the website and where to find it</i> |
| <i>Domain A2</i> | <i>Skills students should have according to the syllabus (using certain concepts in certain</i>           | <i>Connection with the website and where to find it</i> |

|  |           |  |
|--|-----------|--|
|  | contexts) |  |
|--|-----------|--|

| <b>Contexts as mentioned by the syllabus</b> | <b>Connection with the website</b>                              |
|--|---|
| Context 1                                    | Connection with the website and where to find it on the website |
| Context 2                                    | Connection with the website and where to find it on the website |

| <b>Concepts as mentioned by the syllabus</b> | <b>Connection with the website</b>                              |
|--|---|
| Concept 1                                    | Connection with the website and where to find it on the website |
| Concept 2                                    | Connection with the website and where to find it on the website |

8. Include a contact address on your website so visitors can contact you
9. Make sure the website is on top of Google search or recommended by the used school methods

## Discussion

### Limitations

Just like any other research this research has suffered from several limitations. First of all, due to the short amount of time the research could not be as expanded as preferred. If there was more time the instrument could be tested by the website builders of FoodGalaxy.org and after they have adjusted their website, it could be judged by teachers again to see if the instrument actually works. However, for this research only a format for an instrument could be made, which will most probably help website builders towards the right direction.

Another limitation was the time period in which this research took place. The teachers were asked to fill in a questionnaire and to be interviewed around May, which is one of the busiest period for teachers due to exams, final tests and meetings. The sample was therefore smaller than preferred and there cannot be given any guarantee that these outcomes are based on the actual average of all biology teachers.

Another limitation was the lack of information on extracurricular material teachers use, especially on websites, available for the theoretical background. Therefore, some arguments are based on own insight or hearsay.

### Further research

Even though the research suffered from several limitations, these limitations do provide opportunities for further research. First of all, the instrument given by this research can be

tested and judged, which will lead to a better instrument for website builders. The instrument could even be specified for different school subjects (or just a separation between alpha, gamma and beta subjects). If not for this research or for other researches, it would be very useful if there would be a research into the use of websites by teachers. Why do they choose for a specific website, what is the use of that website, why using a website instead of another source and so on. The use of websites increases among teachers and research about this use could be helpful for optimizing websites as well as the lessons at school. The instrument could also be useful for websites such as Ecent or educations that want to make a list of websites classified by concepts and contexts.

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## Appendix 1

*Requirements of the Dutch biology exam concerning food and their belonging subdomains.*

### Exam requirements Senior General Secondary Education

- ❖ The candidate can use the concepts DNA and protein synthesis in contexts in the field of health and food production to explain how materials of the cell are formed (B1).
- ❖ The candidate can use the concepts homeostasis, transport, assimilation and dissimilation in contexts in the field of energy, health and nutrition to explain how the metabolism of cells of prokaryotes and eukaryotes proceeds (B2).
- ❖ The candidate can use the concepts organ, photosynthesis, respiration, digestion, excretion and transport in contexts in the field of energy, health, nutrition and food production to appoint how the metabolism of organisms proceeds and to appoint how disorders in the metabolism can origin and how these can be dealt with (B3).
- ❖ The candidate can use the concepts homeostasis, hormonal regulation and neural regulation in contexts in the field of health, sports and nutrition to explain how eukaryotes regulate themselves (B4).
- ❖ The candidate can use the concept defence in contexts in the field of health and food production to appoint how eukaryotes defend themselves from other organisms, viruses and allergens and how this can lead to problems (B5).
- ❖ The candidate can use the processes of gene expression and cell differentiation in contexts in the field of health and food to appoint how the development of cells proceeds (C1).
- ❖ The candidate can use the concept life cycle in contexts in the field of health and food production to appoint how the development of organisms proceeds and to declare how disruptions of this development can occur, can be prevented and can be solved (C2).
- ❖ The candidate can use the concepts gene regulation and interaction with (a-) biotic factors in contexts in the field of health and food production to appoint how molecular regulation proceeds (D1).
- ❖ The candidate can use the concepts food relationship and interaction with (a-)biotic factors in contexts in the field of sustainability, energy and food production to appoint which relationships exists between populations in ecosystems and to argue how matters relating thereto, may be accessed (D4).
- ❖ The candidate can use the concept DNA replication in contexts in the field of security, energy, health and food production to appoint how genetic material is reproduced (E1).
- ❖ The candidate can use the concept cell cycle in contexts in the field of energy, health and food production to appoint how reproduction of cells proceeds (E2).
- ❖ The candidate can use the concepts reproduction and genetic trait in contexts in the field of security, energy, health and food production to explain how traits can be transferred and to appoint how reproduction of eukaryotes and prokaryotes proceeds (E3).
- ❖ The candidate can use the concepts DNA, mutation, recombination and variation in contexts in the field of health and food production to explain how variation within populations occurs (F1).

### Exam requirements Pre-University

- ❖ The candidate can use the concepts DNA and protein synthesis in contexts in the field of health and food production to explain how self-regulation on molecular level proceeds (B1).

- ❖ The candidate can use the concepts homeostasis, transport, assimilation and dissimilation in contexts in the field of energy, health and nutrition to explain how the metabolism of cells of prokaryotes and eukaryotes proceeds (B2).
- ❖ The candidate can use the concepts organ, photosynthesis, respiration, digestion, excretion and transport in contexts in the field of energy, health, nutrition and food to appoint how the metabolism of organisms proceeds and appoint how disorders in the metabolism can origin and how these can be dealt with (B3).
- ❖ The candidate can use the concepts homeostasis, hormonal regulation and neural regulation in contexts in the field of health, sport and nutrition to explain how self-regulation of eukaryotes proceeds and to argue how disruptions can occur and can be dealt with (B4).
- ❖ The candidate can use the concept defence in the field of health and food production to appoint how organisms defend themselves against other organisms, viruses and allergens and how this can lead to any problems and how these problems can be dealt with (B5).
- ❖ The candidate can use the processes of gene expression and cell differentiation in contexts in the field of health and food to appoint how the development of cells proceeds and to argue how disruptions in this development can occur and can be dealt with (C1).
- ❖ The candidate can use the concept life cycle in contexts in the field of health and food production to appoint how the development of organisms proceeds and to declare how disruptions of this development can occur, can be prevented and can be solved (C2).
- ❖ The candidate can use the concepts gene regulation and interaction with (a-) biotic factors in contexts in the field of health and food production to appoint how molecular regulation proceeds (D1).
- ❖ The candidate can use the concepts food relationship and interaction with (a-)biotic factors in contexts in the field of sustainability, energy and food production to appoint which relationships exists between populations in ecosystems and to argue how matters relating thereto, may be accessed (D4).
- ❖ The candidate can use the concept DNA replication in contexts in the field of security, energy, health and food production to appoint how genetic material is reproduced (E1).
- ❖ The candidate can use the concept cell cycle in contexts in the field of energy, health and food production to appoint how reproduction of cells proceeds and to argue how disruptions can be prevented or can be dealt with (E2).
- ❖ The candidate can use the concepts reproduction and genetic trait in contexts in the field of security, energy, health and food production to explain how traits can be transferred and to appoint how reproduction of eukaryotes and prokaryotes proceeds (E3).
- ❖ The candidate can use the concepts DNA, mutation, recombination and variation in contexts in the field of health and food production to explain how variation within populations occurs (F1).



## Appendix 2

### Questionnaire

Dear teacher biology,

Thank you for your participation on this research. The goal of this research is to produce an instrument which enables builders of websites with educational purposes to maximize the attractiveness of their website for teachers (and therefore students). The research will use the website FoodGalaxy.org as a case study. Unfortunately, this website is still partly under construction. Therefore this research will only use the parts that are ready for use. The headings and subheadings show what the website has to offer when finished.

The questionnaire consists of three parts, namely general questions concerning the demands on educational websites, product specific questions and website specific questions. At the end of each section, you can post further comments; it will be highly appreciated if you write everything that comes to mind during the questionnaire here.

Good luck with the entering of the questionnaire.

#### Questionnaire

A website can be brought under the attention of teachers best if:

- It shows up on top of Google while searching for school material
- It is referred to by other well-used websites
- It is concluded in the school method
- Other, namely: \_\_\_\_\_

#### General questions

What kind of information provided by educative websites would make you use it?

1. The website contains more information than school books

Very unimportant                        Very important

2. The website offers information differently than school books

Very unimportant                        Very important

3. The website offers examples of use in practice

Very unimportant                        Very important

4. The website offers material that can be used in lessons

Very unimportant                        Very important

5. The website offers material that can be used directly in lessons

Very unimportant                        Very important

6. The website provides an overview of the connection between the exam requirements and the website

Very unimportant                        Very important

7. The website offers a separate heading for schools

Very unimportant                        Very important

8. The website interests students in science education

Very unimportant                        Very important

9. The website is, besides English, available in the own language

Very unimportant                        Very important

10. Other, namely:

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**Product specific questions**

1. The website offers material that can be used directly

Very unimportant                        Very important

2. The offered material should meet the concept-context approach\*

Very unimportant                        Very important

3. The offered material should meet the step-by-step approach\*\*

Very unimportant                        Very important

*Read **product 1** and answer the following questions*

## Bad food

After eating a birthday cake Lana got sick; she almost immediately suffered from an itch in the mouth- and throat, hives, had to throw up and got an anaphylactic shock.

Use the website *FoodGalaxy.org* to answer the following questions

1. How did the anaphylactic shock had to be stopped? Did Lana suffer from a food intolerance, or a food allergy?

The next day Lana asks her GP which ingredient caused the symptoms. She did not know she suffered from any allergy or intolerance at all.

2. Provide Lana on behalf of the GP with an explanation about the ingredient that caused the symptoms and how such a reaction can be prevented in the future. Remember that Lana does not have any medical knowledge whatsoever. Use information 1 to answer this question.

When coming home Lana discovers that the other birthday visitors are sick as well, even though they did not have an allergy or intolerance for one of the cake ingredients.

3. Think of a possible cause of the sickness of the other visitors. Mention how this could have been prevented as well.

4. Product 1 meets the concept-context approach

Strongly disagree                        Strongly agree

5. Product 1 is a good example of what kind of materials websites should offer

Strongly disagree                        Strongly agree

6. A website would be more attractive if materials such as product 1 are offered

Strongly disagree                        Strongly agree

7. Product 1 interests students in the subject

Strongly disagree                        Strongly agree

**Information 1**

| <b>Ingredients carrot cake</b>        |
|---------------------------------------|
| 4 eggs (biologic)                     |
| 200g light brown sugar                |
| 250ml sunflower oil (biologic)        |
| 2 tsp ground cinnamon                 |
| ½ bag baking powder                   |
| 300g finely grated carrots (biologic) |
| 2 mashed bananas                      |
| 1 cup chopped walnuts                 |
| 25g butter (biologic)                 |

\* The concept-context approach assumes that biological knowledge (concepts) always will be used in specific contexts. If the biological knowledge is used in a contemporary context, whether an environmental, professional or scientific context, it is likely that we are dealing with biological knowledge which is not only perceived as relevant by students but also will be regarded as relevant by the society.

\*\* The step-by-step approach is comparable to a recipe. Step by step you are led through the assignment.

8. Further comments on product 1

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Read **product 2** and answer the following questions

PRODUCT 2

### **Bad food**

After eating a birthday cake Lana got sick; she almost immediately suffered from an itch in the mouth- and throat, hives, had to throw up and got an anaphylactic shock.

Use the website *FoodGalaxy.org* to answer the following questions

1. How did the anaphylactic shock had to be stopped?
2. What is the difference between a food intolerance and a food allergy?
3. Did Lana suffer from a food intolerance, or a food allergy?

#### Information 1

##### **Ingredients carrot cake**

|                                       |
|---------------------------------------|
| 4 eggs (biologic)                     |
| 200g light brown sugar                |
| 250ml sunflower oil (biologic)        |
| 2 tsp ground cinnamon                 |
| ½ bag baking powder                   |
| 300g finely grated carrots (biologic) |
| 2 mashed bananas                      |
| 1 cup chopped walnuts                 |
| 25g butter (biologic)                 |

The next day Lana asks her GP which ingredient caused the symptoms. She did not know she suffered from any allergy or intolerance at all.

4. Use the website to find which ingredient (see information 1) causes Lana her symptoms.
5. Is there any medication for this allergy/intolerance?
6. How can such a reaction be prevented in the future?

When coming home Lana discovers that the other birthday visitors are sick as well, even though they did not have an allergy or intolerance for one of the cake ingredients.

7. What could be a possible cause of the sickness of the other visitors?
8. How could this have been prevented?

9. Product 2 meets the step-by-step approach

Strongly disagree                        Strongly agree

10. Product 2 is a good example of what kind of materials websites should offer

Strongly disagree                        Strongly agree

11. A website would be more attractive if materials such as product 2 are offered

Strongly disagree                        Strongly agree

12. Product 2 interests students in the subject

Strongly disagree                        Strongly agree

13. Further comments on product 2

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**Website specific questions**

Look globally at the website [www.foodgalaxy.org](http://www.foodgalaxy.org) and answer the following questions

1. Product 1 is suitable for orientation of the website

Strongly disagree                        Strongly agree

2. Product 2 is suitable for orientation of the website

Strongly disagree                        Strongly agree

3. The website meets the following demands

a. More information than school books

Strongly disagree                        Strongly agree

b. Career possibilities

Strongly disagree                        Strongly agree

c. Examples of use in practice

Strongly disagree                        Strongly agree

d. Refers to other sources

Strongly disagree                        Strongly agree

4. The website is attractive

Strongly disagree                        Strongly agree

5. The website shows possibilities to be used in lessons

Strongly disagree                        Strongly agree

6. If the website offers products like product 1 I would want to use it in my lesson

Strongly disagree                        Strongly agree

7. If the website offers products like product 2 I would want to use it in my lesson

Strongly disagree                        Strongly agree

8. Only if the website offers both such products, I would want to use it in my lesson

Strongly disagree                        Strongly agree

Read the text below

***“How does the website FoodGalaxy fit the Dutch exam requirements concerning the subject biology?”***

*“The website FoodGalaxy contains information on almost every topic concerning food, which includes topics such as food production, food supply, fermentation and nutrition. Nutrition is a very important theme of the exam program. Moreover, the website offers a section ‘My food career’ with several sub headings which contain information on career possibilities, internships and new methods to overcome old problems. The website also provides information on upcoming technologies to create new food and examples of upcoming machines, such as the 3D-printer. Furthermore, the website shows multiple examples of food technology in practice, such as the harvesting of tomatoes by farmers. Finally, the website refers to other sources, such as videos of YouTube, which in their turn provide information on the connection of food with the different functions of the human body and the best way to prepare your food. ”*

9. If the websites shows the agreements with the exam requirements (in a narrative way) I would find the website more attractive to use in my lesson

Strongly disagree                        Strongly agree

10. In such a narrative overview the following parts are important to mention:

- o List of topics
- o Description of new technologies
- o Description of career- and education possibilities
- o Description of the connections and other features of the website structure
- o Other, namely \_\_\_\_\_

Read the text below

***“How does the website FoodGalaxy fits the Dutch exam requirements concerning the topic biology?”***

| <b>Contexts as mentioned by the syllabus</b> | <b>Connection with the website</b>  |
|--|---|
| Sustainability                               | Information on sustainable food growing (see subheading ‘Sustainability’) and information on taking sustainable care of food in general (see heading ‘Mission impossible’)                    |
| Energy                                       | Indirect information on the influence of food on the energy level of humans (see subheading ‘Food & Health’)  |
| Health                                       | Information on the influence of food on human health (see subheading ‘Food & Health’)   |
| Health care                                  | Information on bacteria in food (see subheading ‘Microorganisms’), allergies and their symptoms, diagnoses and solutions (see subheading ‘Allergies and intolerances’)                        |
| Sports                                       | Information on the influence of food on the brain and by the brain directed sportive activities (see subheading ‘Food & Sport’)   |
| Safety                                       | Information on what is and what is not safe concerning food (see heading ‘To eat and not to eat’)   |
| Nutrition                                    | Information on different food products (see heading ‘A small product for the consumer – a giant process for the producer’)  |
| Food production                              | Information on genetic modification (see subheading ‘GMO’), food production in general, conservation methods (see heading ‘Once upon a time’) and food transport (see subheading ‘Packaging’) |

***Connection of the website with the domains as mentioned in the syllabus***

| <b>Domain</b> | <b>Skills as mentioned by the syllabus</b>  | <b>Connection with the website</b>   |
|---------------|---|--|
| B4            | The candidate can use the concepts homeostasis, hormonal regulation and neural regulation in contexts in the field of health, sport and nutrition to explain how self-regulation of eukaryotes proceeds and to argue how disruptions can occur and can be | On the website is a video which shows how food influences the brain, which directs the body to sportive activities (see subheading ‘Food & Sport’) |

|  |   |  |
|--|---|--|
|  | dealt with.   |  |
| B5   | The candidate can use the concept of defence in the field of health and food production to appoint how organisms defend themselves against other organisms, viruses and allergens and how this can lead to any problems and how these problems can be dealt with. | The website offers information on all sorts of allergies, intolerances (see subheading 'Allergies and intolerances') and bacteria concerning food including symptoms, diagnoses and medication |
| <i>This will be indicated like this for every domain the website connects with</i> |   |  |

11. If the website shows the agreements with the exam requirements (in an overview table) I would find the website more attractive to use in my lesson

Strongly disagree                        Strongly agree

12. In such a table overview the following parts are important to mention:

- Context area's and how the website meets those area's
- Domains with concepts and how the website meets those domains
- The forms in which the subjects are offered by the websites
- Other, namely \_\_\_\_\_

13. If I had to choose between the narrative overview or an overview table I would choose:

- Narrative overview (example 1)
- Table overview (example 2)

Explanation of the answer:

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14. Only if the website is available in Dutch I would use it in my lesson

Strongly disagree                        Strongly agree

15. Further comments:

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Thank you for your participation!



## Appendix 3

### Example instrument

#### Steps to increase the attractiveness of an educational website

1. Provide more information than the regular school books do
2. Provide examples of use in practice
3. Use a clear structure
4. Make sure the lay out fits the purpose of the website
5. Provide several materials that can be used directly in lessons and fit the concept-context approach
6. Make sure the website is not just available in English, but also in the mother language of the country the website is meant for
7. Provide an overview of the connection between the exam requirements and what the website has to offer. Use a structured table and mention domains, concepts and contexts as mentioned by the syllabus. For example:

| <b>Domains</b>   | <b>Skills as mentioned by the syllabus</b>  | <b>Connection with the website</b>                      |
|------------------|---|---|
| <i>Domain A1</i> | <i>Skills students should have according to the syllabus (using certain concepts in certain contexts)</i> | <i>Connection with the website and where to find it</i> |
| <i>Domain A2</i> | <i>Skills students should have according to the syllabus (using certain concepts in certain contexts)</i> | <i>Connection with the website and where to find it</i> |

| <b>Contexts as mentioned by the syllabus</b> | <b>Connection with the website</b>                                     |
|--|--|
| <i>Context 1</i>                             | <i>Connection with the website and where to find it on the website</i> |
| <i>Context 2</i>                             | <i>Connection with the website and where to find it on the website</i> |

| <b>Concepts as mentioned by the syllabus</b> | <b>Connection with the website</b>                                     |
|--|--|
| <i>Concept 1</i>                             | <i>Connection with the website and where to find it on the website</i> |
| <i>Concept 2</i>                             | <i>Connection with the website and where to find it on the website</i> |

8. Make sure the website is on top in Google search or recommended by the used school methods

