Measuring the Effect of Instruction in Metacognitive Knowledge and Skills on the Autonomy of First-Year Vocational Education Students

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Abstract

Vocational education institutions are introducing more student-centred learning environments, requiring first-year students to make decisions about and self-regulate their behaviour. However, this autonomous behaviour is difficult for first-year students due to age, the transition to vocational education, and the fact that vocational education does not provide well-developed guidance in autonomy. Therefore, it is important to include this guidance. One way to include guidance is by training metacognition. Hence, for the current study, an intervention in metacognition was designed. This intervention consists of an instruction in metacognition, followed by practice materials to teach metacognition and practice the use of metacognitive skills, aiming at increasing metacognition. The effects of the intervention on metacognitive knowledge and skills were analysed by calculating t-tests from the questionnaire 'Metacognitive Knowledge and Skills' filled in by 50 first-year students before and after instruction. The instruction had positive effects on metacognitive knowledge and metacognitive skills of monitoring and evaluating. The effect of the practice materials could not be determined due to low use. The relation between age and the development of metacognition was analyzed by calculating the correlation between age and the difference in metacognition after the intervention to determine if differentiated guidance is necessary, showing no relation. The relation between metacognitive knowledge and skills was analyzed, which resulted in a positive, moderate relation. These results show how metacognition can be trained by making vocational students aware of metacognition in the context of a learning task, and how acquainting metacognitive knowledge contributes to the development of metacognitive skills.

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Problem Statement

Over the past decade, many higher education institutions have been introducing student-centred learning environments (Duchatelet & Donche, 2019). Student-centred learning environments require students to make their own decisions in their learning process. Therefore, higher educational institutions require students to be autonomous. *Autonomy* refers to the ability of an individual to make their own decisions about and to self-regulate their own behaviour, emotion and/or cognition (Peterson & Bush, 1999), as well as inhibit undesired behaviour (Allen & Loeb, 2015).

However, being autonomous is found to be hard for students, especially for first-year vocational students (Fokkens-Bruinsma et al., 2020). This is often assigned to difficulties that arise from the transition from secondary school to the first year of higher education. During this time, students must adjust to a new educational environment, which might be more student-centred than these students have experienced before. Therefore, autonomy is suddenly demanded, but it is not supported in vocational education. Instead of providing structured guidance in autonomy, vocational education believes that autonomous learning can happen by offering less structure (e.g., providing no classical lessons; Kuijpers et al, 2006). Offering less structure is ineffective for increasing autonomy, especially for first-year students since it cannot be expected that these students master autonomous behaviour. The age group of these students (fifteen to 23 years old) has an underdeveloped prefrontal cortex, which is responsible for autonomous behaviour such as inhibition (Swaab & Swaab, 2015), making it hard for these students to show autonomous behaviour. Therefore, guidance is of vital importance for first-year students to develop the level of autonomy that is required in the new learning environment.

Based on the difficulties experienced by first-year students of vocational education to show autonomous behaviour in the new learning environment and the lack of (knowledge regarding) effective guidance in autonomy within vocational education, the aim of the current study is to collect information on effective guidance in autonomy for first-year vocational students.

Theoretical Framework

Autonomous Learning & Metacognition

Martín Celis and Cárdenas (2014) found three elements learners need to be aware of to become autonomous learners as they are considered the starting point of becoming autonomous learners: 1) their learning styles, 2) their behaviour in class, and 3) their best learning options. Learners should recognize their personal strengths and weaknesses to see what learning styles work best, what behaviour they need to show for effective learning, and which provided learning options they need to choose for effective learning. The awareness of the named elements is related to metacognitive knowledge, which is knowledge a learner has about what learnings strategies to use, when to use them, and how to use them based on personal strengths and weaknesses (Veenman, 2015). Therefore, it seems that having metacognitive knowledge is an important starting point for creating autonomous learners.

Also found by Martín Celis and Cárdenas (2014), there are three elements learners need to use in the learning process to be autonomous learners: 1) work plans based on prior knowledge and the learning objectives, 2) effective learning strategies based on the objectives, and 3) reflection on the objectives to relate what is happening in the class to the work plan and how it relates to their own learning agenda. The use of these elements is related to metacognitive skills, which are skills used by a learner while going through a learning task to help the learner get insight into their learning process (Pintrich, 2004; Veenman, 2015; Zimmermann, 2002). The use of metacognitive skills is a better predictor for academic

achievement than intelligence or motivation (Veenman, 2015). The first metacognitive skill is planning of learning tasks, in which the learner analyses the task, retrieves prior knowledge, forms learning objectives, and forms a plan based on all this information (Pintrich, 2004; Veenman, 2015; Zimmermann, 2002), similar to the work plans used by autonomous learners. The second metacognitive skill is monitoring progress using learning strategies, in which the learner looks at the progress based on the goals, comprehension, and given time. When there is no progression, the learner needs to use learning strategies to make progression again by, for example, looking up a word they do not understand, like autonomous learners do. The third and final metacognitive skill is evaluating the results of the learning tasks as well as the performance, also similar to what autonomous learners do. Therefore, it seems that autonomous learners use metacognitive skills in their learning process.

Supporting the Use & Development of Metacognitive Skills

In literature, the following pointers were found to consider when supporting and encouraging the use and development of metacognition, meaning metacognitive knowledge and skills: the target group of the intervention (Fokkens-Bruinsma et al., 2020), creating awareness of metacognition (Apaydin & Hossary, 2017; Valcke, 2019; Veenman, 2015), learning in the context of a learning task (Dedic, 2014; Pintrich, 2002; Veenman, 2015), and prolonged training (Apaydin & Hossary, 2017; Eshuis et al., 2019: Mayer & Fiorella, 2014; Veenman, 2015).

The Target Group of the Intervention

Looking at the target group can help identify possible pointers that need to be considered when encouraging the use of metacognitive skills is the aim. The target group of the current study, that being first year vocational education students, deals with motivational problems. First-year students just made the choice of what they want to study, which is a choice that highly decides their careers in following years (Kuijpers et al., 2006). When the chosen

program does not match with the student, and because education is obligatory for the majority of the target group, first-year students stay in a learning environment that does not motivate them. A way to increase motivation is by making sure students can make decisions about the way they learn, but this is only effective for increasing motivation when intensive and structured guidance is giving. Therefore, an intervention in metacognition should be intense and very structured.

Like previously mentioned, the transition to higher education is a challenge for vocational education students (Fokkens-Bruinsma et al., 2020). First-year students need to make sense of the new program by adjusting expectations and identify the needs, knowledge, and skills needed within this new program. Expectations are adjusted within the first few weeks of the program. Therefore, expectations from the program should be made clear within this time period.

Creating Awareness of Metacognition

Students should be aware of two components regarding metacognition: 1) the process and 2) the importance of metacognition. Regarding the process, students need to be aware of what metacognitive skills are and how to use them in order to apply and master these skills (Valcke, 2019). In research done by Apaydin and Hossary (2017), the intervention of Cognitive Strategy Instruction (CSI) was used to develop metacognition by making university students aware of the concept. CSI is an instructional approach which emphasizes the development of thinking skills to enhance learning. With CSI, the instructor introduces the students to the concept of metacognition, makes the students aware of specific steps used while learning, and gives the students opportunities to practice with these steps. Positive results were found in self-reflection, identification of personal values, and ease of implementation of metacognitive strategies compared to the control group, emphasizing the importance of process awareness. Also, regarding the process, students and teachers should be

aware of which metacognitive skills students use and do not use and why metacognitive skills are not being used to design a fitting intervention. Mayer and Alexander (2011) and Veenman (2015) describe two reasons why metacognitive skills are not being used by learners: 1) production deficiency and 2) availability deficiency. *Production deficiency* is when a learner has developed metacognitive skills but does not use these skills. Reminders of using metacognitive skills are needed for this type of learner. *Availability deficiency* is when a learner does not use metacognitive skills, because they do not know how and when to use metacognitive skills. Availability deficiency can be a sign of low metacognitive knowledge. Metacognitive knowledge is important for applying relevant learning strategies for the control and regulation of learning, in other words using metacognitive skills (Dedic, 2014).

Furthermore, students should be aware of the importance of metacognition (Veenman, 2015). Students need to know why it is important to use and develop metacognitive skills or else students will see the use and development of metacognitive skills as extra work, therefore not using the skills.

Learning Metacognitive Skills in the Context of a Learning Task

For students to acquire metacognitive skills, it will likely be more effective if it is imbedded in a learning task, not taught abstractly (Pintrich, 2002; Veenman, 2015). In research done by Dedic (2014), students were going through an inquiry learning task while thinking aloud and were guided by the researcher to think about the learning process. The results showed an increase in metacognitive knowledge after four inquiry learning sessions, and there was a relation found between metacognitive knowledge and metacognitive skills. The explanation was that metacognitive skills are used when a learner knows how and when to use these (e.g., metacognitive knowledge). Therefore, use of metacognitive skills should be made clear by an instructor while going through a learning task for first-year students to gain metacognitive knowledge, resulting in higher use of metacognitive skills.

Prolonged Training to Master the Use of Metacognitive Skills

For students to ensure mastery in the application of metacognitive skills, prolonged training is necessary (Veenman, 2015). A moment of instruction in metacognitive skills might help with gaining metacognitive knowledge necessary for correctly applying metacognitive skills (Mayer & Fiorella, 2014), but repetition is necessary for making the application of metacognitive skills a habit and for students to be able to transfer the use of metacognitive skills to other tasks. In previous research, it was shown that in vocational education only instruction does not encourage desired behaviour but with additional support, students are able to connect their experiences with knowledge acquainted form the instruction, positively affecting the desired behaviour (Eshuis et al., 2019). In the research done by Apaydin and Hossary (2017), CSI gave the students opportunities to practice with these steps. In this research, positive results regarding ease of implementation of metacognitive strategies were found compared to the control group. Therefore, prolonged training should be provided to increase the use and development of metacognitive skills.

Current Study

Based on the aforementioned literature, an intervention aimed at increasing metacognition should make students aware of metacognitive skills and the importance of using them in a learning task, with the aim of increasing metacognitive knowledge (Apaydin & Hossary, 2017; Valcke, 2019; Veenman, 2015). The literature also showed that students should have opportunities to practice the use of metacognitive skills to master these skills (Apaydin & Hossary, 2017; Eshuis et al., 2019: Mayer & Fiorella, 2014; Veenman, 2015), and how metacognitive skills should be taught in the context of a learning task (Dedic, 2014; Pintrich, 2002; Veenman, 2015). Based on these findings, the intervention in metacognition developed for the current study consisted of two parts: 1) instruction in metacognition and 2) practice materials which guide the first-year students in planning, monitoring, and evaluating learning

tasks. The aim of the instruction in metacognition was to make the first-year students aware of metacognitive skills and their importance, as well as teaching them how to use metacognitive skills within the context of a learning task, with the aim of increasing metacognitive knowledge. The practice materials provided prolonged training in the use of metacognitive skills, imbedded in the learning context with the aim of increasing the use of these skills. The literature also showed a relation between metacognitive knowledge and metacognitive skills (Dedic, 2014). Therefore, research questions on the effects of the two parts of the intervention, as well as on the relation between metacognitive knowledge and metacognitive skills, were included in the current study to provide information on effective guidance in autonomy.

Like mentioned in the problem statement, when students start vocational education at age of 15-23, their brain is still in development, specifically the prefrontal cortex (Swaab & Swaab, 2015). This area of the brain is responsible for planning and regulating, as well as inhibiting impulses. The prefrontal cortex keeps developing until the age of 25. This means that first-year students might find it difficult to apply metacognitive skills but will get better at using metacognitive skills as they get older. Therefore, the current study included a research question regarding the relation between the age of the first-year students and the development of metacognition to see if guidance in autonomy should be structured differently for different ages.

Based on the intervention in metacognition, a main research question was formulated, along with four sub-questions. The main research question of the current study was: '*To what extent does instruction in metacognitive knowledge and skills and the practice materials help develop metacognitive knowledge and skills among first-year students?'*

This research question was divided into four sub-questions. Sub-questions with their hypothesized outcome were formulated as followed:

- *To what extent does the instruction in metacognition help develop metacognitive knowledge and skills among first-year vocational students?*

The instruction in metacognition will increase the metacognitive knowledge of the first-year students, but the use of metacognitive skills will stay the same. The instruction in metacognition makes the first-year students aware of metacognitive skills and the importance of the use of metacognitive skills, but does not provide prolonged training (Veenman, 2015). Therefore, only an increase in metacognitive knowledge is expected.

- *To what extent do the practice materials help develop metacognitive knowledge and skills among first-year vocational students?*

The practice materials will increase metacognitive knowledge and metacognitive skills. The practice materials give the first-year students the time and opportunity to use metacognitive skills in the context of a learning task for a period of time, a form of prolonged training (Veenman, 2015). Therefore, an increase in the use of metacognitive skills is expected.

- *What is the relation between the age and the development of metacognitive knowledge and skills among first-year vocational students?*

The relation between age and the development of metacognitive knowledge and skills is expected to be negative. This is because older first-year students have, according to the literature, a more developed prefrontal cortex, having further developed metacognitive skills (Veenman, 2015). Therefore, the younger first-year students will learn more from the intervention, making a bigger development than older peers.

- *What is the relation between metacognitive knowledge and metacognitive skills among first-year vocational students?*

The relation between metacognitive knowledge and metacognitive skills is expected to be positive. The literature shows that if students know how to use metacognitive skills, the

students will use them more than when they do not know how to use metacognitive skills (Dedic, 2014; Veenman, 2015). Therefore, a positive relation is expected.

The current study was conducted within the context of the program Software Development at the ROC of Flevoland, located in the Netherlands. In the first year of the vocational education, first-year students gain knowledge by working in Google Classrooms individually and at their own pace. Therefore, the program Software Development requires the first-year students to be autonomous. However, it was made clear that the teachers have not implemented any type of intervention with the intention of increasing autonomy, even though the teachers want their first-year students to be autonomous (R. Korswagen, personal communication, May 9th, 2022). Therefore, the teachers wanted to know what they can do to guide their first-year students in being autonomous (S. Baalhuis, personal communication, November 10th, 2022).

Research Design

To answer the research question and sub-questions, an experimental research design was used. In the pre-test and first post-test, the level of metacognitive knowledge and the use of metacognitive skills (e.g., planning, monitoring, and evaluating) were measured using a quantitative measure to be able to determine the effect of the instruction. The second post-test, with the aim of measuring the effect the practice materials had on the level of metacognitive knowledge and the use of metacognitive skills, was not conducted due to low use of the practice materials. As an alternative, an exploratory research design was used to construct determinants of low motivation within the program Software Development.

Method

Participants

In total, 62 first-year vocational students of the program Software Development participated in the current study. The first-year students were randomly assigned to one of

four groups by a teacher, consisting of sixteen to nineteen first-year students per group. Groups were made for the instructor to have overview and control over the first-year students during the instruction in metacognition to make sure the first-year students stayed focused and to monitor the reactions of the students.

Out of the 62 first-year students, twelve first-year students did not give permission to use their data and were excluded from the sample. This led to a remaining group of 50 first-year students of the education of Software Development, with 46 first-year students participated in the first measurement of metacognition and 47 first-year students participated in the second measurement of metacognition. The difference in participants is due to not all first-year students being present at school or responsive to emails around the time of the first or second measurement of metacognition. This led to the final sample being 43 first-year students who participated in two measurements of metacognition (*M*age = 17.12, *SD* = 1.66). The students within the sample attended at least one out of four sessions of the instruction in metacognition. The majority of the first-year students in the final sample had a Dutch nationality (92%).

Materials

The Instruction in Metacognition

The main aim of the instruction in metacognition was to increase the metacognitive knowledge of the first-year students. This means that, at the end of the instruction in metacognition, the first-year students knew what metacognitive skills are, why metacognitive skills are important to use within a learning task, and how to use metacognitive skills in a learning task. The instruction was formed based on the following pointers that were found to be important when supporting and encouraging the use and development of metacognition: creating awareness of metacognition (Apaydin & Hossary, 2017; Valcke, 2019; Veenman, 2015), and learning in the context of a learning task (Dedic, 2014; Pintrich, 2002; Veenman,

2015). The instruction in metacognition was giving in the beginning of the school year, with the first session given in the fifth week of the school year, to make expectations of the program clear to the students (Fokkens-Bruisma et al., 2020).

The aim of the *first session* of the instruction in metacognition was to introduce the first-year students to the concept of metacognition. This session started with a short introduction round with the aim of getting to know each other, followed by the introduction to the concept of metacognition, consisting of metacognitive knowledge and metacognitive skills. it was told that metacognitive knowledge is knowledge about personal strengths and weaknesses, learning strategies, and when and how to use learning strategies. The explanation of metacognitive knowledge was followed by the explanation of metacognitive skills (e.g., planning, monitoring, and evaluating). The importance of the use of metacognitive skills in the context of the program Software Development was explained by showing the classification dossier of the program, which showed that the use of metacognitive skills is expected when finishing the program. At last, the questionnaire 'Metacognitive Knowledge and Skills', which functioned as pretest, was distributed and filled in (see Appendix A).

The *second session* of the instruction in metacognition had the purpose to go more detailed into planning. After a short repetition of the first session, the four steps of planning were introduced. The four explained steps were: 1) analyzing the task, 2) bringing up prior knowledge, 3) formulating the goal to be reached at the end of a task, and 4) making a planning on how to reach the goal. After the explanation, an example of a learning task the first-year students could encounter in their Google Classrooms was shown, and the steps of planning were applied to the task. At the end, a planning was showed that could be formed when applying the four steps of planning, made by one of the Software Development teachers. This was done to make sure the planning could be used for the next session for each group.

In the *third session* of the instruction in metacognition, the planning from the second session was executed to practice monitoring and evaluating of a learning task. This session stared with a short repetition of the second session, followed by the display of the planning of the second session. Next, the planning principles the teacher used by the teacher were explained to give the students more guidelines on planning. There were five principles behind the planning steps: 1) smaller steps or goals within the planning give more motivation, 2) take working principles within the relevant profession into account when planning (e.g., a form of prior knowledge), 3) looking at all possible solutions for the problem, 4) to include the solution of the problem that works best for the learner (related to metacognitive knowledge), and 5) to make sure the steps in the planning are working towards the formulated goal. After the explanation of the principles, the explanation of the concept of monitoring followed. It was told that monitoring is about asking three questions during the execution of the planning: 1) 'do I still understand the task?', 2) 'am I still working towards my goal?', and 3) 'do I still have enough time to finish the task within the given time?'. Students were also told that if any of these questions could be answered with 'no', learning strategies must be applied. After this explanation, the planning from the second session was executed with the help of the teacher of the program of Software Development that made the planning. A few mistakes in the execution of the planning were intentionally put in the execution of the plan by the teacher to show the importance of monitoring and the use of learning strategies. After the task was completed, the step of evaluating was explained. Evaluation can be done by looking at two parts: 1) if the goal is reached, and 2) what was done to make sure the goal was (not) reached. The task execution was evaluated, and the mistakes and corrections made by the teacher were evaluated to show the importance of evaluation.

The aim of the *final session* of the instruction in metacognition was to repeat all the previous sessions. The concept of metacognition was repeated, as well as the concepts of

metacognitive knowledge and skills. All the steps within planning, monitoring, and evaluating were repeated and the actions taken in the example of a learning task were brought up again. After the repetition, the questionnaire 'Metacognitive Knowledge and Skills' was distributed and filled in, functioning as post-test, with evaluation questions about the sessions of instruction in metacognition added.

The four sessions were checked by one of the teachers of the education of Software Development to make sure the instruction in metacognition was not too difficult for the first-year students to understand.

Practice Materials

After the four sessions of instruction in metacognition were given, the practice materials were added to the Google Classrooms the first-year students were working on. The aim of the practice materials was to provide prolonged training of metacognitive skills in the context of a learning task, which was found important for developing metacognitive skills (Apaydin & Hossary, 2017; Dedic, 2014; Eshuis et al., 2019: Mayer & Fiorella, 2014; Pintrich, 2002; Veenman, 2015). The practice materials consisted of an orientation assignment (see Appendix B), which was placed above the content of the Google Classrooms the first-year students were working on, and an evaluation assignment (see Appendix C), which was placed below the content of the Google Classrooms.

An orientation assignment was an assignment the first-year students needed to finish before starting with the content of the Google Classroom, consisting of the four subtasks that represented the four steps taken when planning. The subtasks were: 1) analyzing the task, 2) thinking about what the first-year student already knows of (the subject of) the task, 3) formulating learning goals, and 4) formulating a plan to reach the learning goals. In the first subtask within the orientation assignment, the first-year student is asked to scroll through the Google Classroom and to look at the different chapters, to look at titles and other outstanding

parts, to write down what the first-year student thinks the Google Classroom is about, and what the first-year student think they are going to learn. The second subtask asks the first-year student to write down what they already know about the subject based on the analysis they have done previously. The third subtask asks the first-year student to look at the goals of the Google Classroom that are formulated by the teachers of the education of Software Development. The formulated goals were used to make sure the first-year student knows what they need to focus on while learning in the Google Classroom. The final subtask asks the first-year student to make a planning for the Google Classroom and the five principles for doing so are displayed.

An evaluation assignment was done after the first-year students were finished with the content of the Google Classroom. The evaluation assignment shows the learning goals of the Google Classroom to the first-year student. The first-year student must indicate per goal if they think they have reached the goal, give an example that shows that they have reached the goal, and what they did to reach the goal. If the first-year student did not reach a goal, they need to write down why they think they did not reach this goal and what they would do differently next time to reach a similar goal in a future learning task.

Measurement of Metacognitive Knowledge

To measure the development of metacognitive knowledge among the first-year students, five items from the scale 'Metacognitive knowledge about the learning process' from Van Nguyen and Habók (2021), adapted from Catterol (1995, 1999) and Hsu (2005), were used. The five items used in the questionnaire 'Metacognitive Knowledge and Skills' of the current study represented metacognitive knowledge about how to implement metacognitive skills. For example, one item ('*I know how to set my own learning goals'*) represents knowledge about a part of the metacognitive skill of planning. In the research of Van Nguyen and Habók (2021), the scale 'Metacognitive knowledge about the learning process' consisted of six Likert scale

items, but one item was not included in the current study due to the item being about measuring the perception of the participant regarding the importance of knowing certain characteristics of a person to learn rather than knowing how to apply metacognitive skills. The five items used in the questionnaire 'Metacognitive Knowledge and Skills' came with a 100-mm rating scale, meaning participants needed to write down a number between 0 and 100. A score of 0 meant the participant had no idea how to execute the described metacognitive skill, and 100 meant the participant knew exactly how to execute the described metacognitive skill. The change from a Likert scale to a 100-mm rating scale was done to be consistent with the measurement of the use of metacognitive skills. The five items were translated to Dutch and adjusted to fit the vocabulary of the first-year students. The reliability of this section of the questionnaire was found to be moderate (r = .667).

Measurement of the Use of Metacognitive Skills

To measure the development of the use of metacognitive skills among the first-year students, 35 items from the Metacognitive Awareness Inventory by Schrawn and Dennison (1994) were used. The 35 items formed the scales Planning (PL) (e.g., '*I think about several ways to solve the problem and choose the best way*'), Monitoring Understanding (MU) (e.g., '*I regularly ask myself if I am working towards my goals*'), Using Learning Strategies (ULS) (e.g., '*I slow down when I come across important information*'), Progress to Guard (PG) (e.g., '*I stop and read again when I get confused*'), and Evaluating (EV) (e.g., '*I ask myself to what extent I have achieved my goals when I am done'*). This measurement used the same rating scale as the measurement of metacognitive knowledge, with a score of 0 meant the participant never executed the described activity during a learning task, and 100 meant the participant always executes the described activity. The five scales were used in the questionnaire 'Metacognitive Knowledge and Skills' of the current study, in which the scales MU, ULS, and PG were used to calculate a mean score representing monitoring of progression. The

items used in the constructed questionnaire were, again, translated to Dutch and adjusted to fit the vocabulary of the first-year students. The reliability of this section of the questionnaire was found to be high (r = .899).

Interview Scheme

To get insight in the determinants of motivation within the program Software Development, two focus groups meetings were organized. The focus groups were led with an interview scheme (see Table 1).

Table 1

Interview Scheme for the Focus Groups regarding Motivational Problems

	Do you currently experience motivational problems to work in your Google Classrooms?	
Possible answers given by students	No	Yes
Follow-up questions based on answer given to the students	What aspects of the education of Software Development keep you motivated to work in the Google Classrooms? What do you do that motivates you to keep working in the Google Classrooms?	What do you think the reason is that you do not feel motivated to work in the Google Classrooms? What was done within the education of Software that motivated you to learn software development? What made this activity motivating for you? What can the teachers within the education of Software Development do to motivate you to learn software development?

Procedure

Instruction in Metacognition

The 43 first-year students that participated in the current study were sent four invites for each session of the instruction in metacognition, with four sessions in total given in four weeks. When a session was about to be given to a group, the first-year students of the group were called out and it was said by a teacher that the first-year students needed to go to the lecture room that was used for the instruction in metacognition. After waiting for all first-year students of the group to be in the lecture room, the first-year students of the group needed to indicate their presence. If a first-year student was not present during the session for the group they were assigned to, the first-year student attended the session with another group if this was possible.

In all four sessions, the 43 first-year students listened to and followed instructions from the instructor. In the first session of the instruction in metacognition, the first-year students filled in the questionnaire used in the current study for the first time, which took 15 to 30 minutes to complete. In the fourth session of the instruction in metacognition, the first-year students filled in the questionnaire used in the current study for the second time, which took the first-year students the same amount of time as the first time the questionnaire was filled in. The four sessions of instruction in metacognition each took 45 to 90 minutes to complete.

Practice Materials

After the four sessions of instruction in metacognition were given, the first-year students continued working in the Google Classrooms, in which the practice materials were added. Before starting to work on the content of the Google Classroom, three first-year students finished one orientation assignment. This took the first-year students fifteen to 30 minutes (anonymous student, personal communication, January 30th, 2023). After finishing the content of the Google Classroom and before starting a new Google Classroom, three first-year students finished one evaluation assignment, which also took around fifteen to 30 minutes to complete (anonymous student, personal communication, January 30th, 2023).

Focus Group

Two focus groups were conducted with thirteen first-year students in total (*M*age = 16.54, *SD* = 1.05). The aim of the focus groups was to construct the determinants of the experienced low motivation.

The thirteen first-year students were selected on January 30th by asking first-year students if they wanted to participate in a conversation regarding the education of Software Development and personal motivation within the education. When the first-year students wanted to participate in the conversation, they were directed to a lecture room. When all the participating first-year students were seated, they followed the instruction of the instructor and answered the questions of the instructor. The first focus group took 34 minutes, and the second focus group took nineteen minutes to complete.

Data Analysis

The data analysis of the questionnaire was done using the computer program SPSS (version 26). Data were collected with names of the first-year students to check demographic information. Before data analysis, the names of the students were changed to numbers. A list of the numbers and the first-year student the number referred to was kept in a file in Microsoft Excel.

Analyzing the Effect of the Instruction

To see what the effect of the instruction in metacognition had on metacognitive knowledge and the use of metacognitive skills among first-year students, a paired sample t-test between the mean of the five items representing metacognitive knowledge, between the means of the 35 items for metacognitive skills, as well as between the means of the items for planning, monitoring, and evaluating. The paired data assumption was met due to the use of repeated measures with the same participants, and the independence assumptions was met. The scores

of the differences before and after the instruction in metacognition, therefore meeting the normal population assumption.

Analyzing the Determinants of Motivation

Using the method of inductive coding, the answers given in the focus session by first-year students were transformed into codes with variations by comparing the experiences that caused motivational problems with the experiences that increased the motivation of the first-year students, resulting in a coding scheme (see Table 2). The aim of the coding scheme was to give insight into what factors motivate a student in the learning environment when its presence is high and demotivates a student when its presence is low. Codes that represented the determinants in motivation within the program were formed by breaking down the data from the focus sessions into smaller samples. Two samples were read through and codes (e.g., determinants of motivation) were formed. These codes were further defined and checked by applying them on the other samples. This process was repeated to check the codes again. The determinants had to be based on personal experiences, e.g., first-year students must have felt an increase or decrease in motivation instead of the student making suggestions or guesses. It became important to form these determinants because students need to actively participate in their learning process in order to become autonomous (Martín Celis & Cárdenas, 2014).

Table 2

Coding Scheme representing the Determinants of Motivation among First-Year Students

Code	Definition	Variations
Guidance by teacher	The guidance of the teachers that influences the motivation experienced by first-year students	- Availability of guidance - Intensity of guidance

Variation within the education	The amount of variation within the education of software development that influences the motivation experienced by first-year students	- Variation in content - Variation in process

Analyzing the Relation between Age and Metacognition

To analyze the relation between age and the development of metacognitive knowledge and skills, a correlation coefficient analysis was preformed between the age of the first-year students and the difference between the means of the first and second measurement of the five items representing metacognitive knowledge. A correlation coefficient analysis between the age of the first-year students and the mean of the 35 items representing metacognitive skills was performed as well.

Analyzing the Relation between Metacognitive Knowledge and Metacognitive Skills

To show the relation between metacognitive knowledge and metacognitive skills, a correlation coefficient analysis was preformed between the mean of the five items representing metacognitive knowledge and the 35 items representing metacognitive skills for the pre- and posttest.

Results

To What Extent does the Instruction in Metacognition help develop Metacognitive Knowledge and Skills among First-year Vocational Students?

The mean scores of the questionnaire filled in before and after the instruction in metacognition show an increase on all measured elements (see Table 3) and were normally distributed. This was checked by forming box plots of the differences in scores before and after the instruction in metacognition to check for outliers, which were not present.

Table 3

Means and Standard Deviations of the Components of Metacognition Before and After the Instruction in Metacognition

	Before the instruction		After the instruction	
	M	**SD**	**M**	**SD**
Metacognitive knowledge	70.48	10.43	76.39	13.61
Metacognitive skills	61.04	11.31	65.86	12.31
Planning	59.07	13.92	61.52	18.62
Monitoring	63.37	10.99	68.71	11.81
Evaluating	54.79	16.43	60.51	16.32

After the instruction in metacognition, the mean score on metacognitive knowledge was significantly higher, $t(41) = 2.18$, $p = .035$. The mean score on metacognitive skills was found to be significantly higher after instruction as well, $t(41) = 3.24$, $p = .002$. When looking at the metacognitive skills individually, there was no significant difference found in the use of planning after instruction, $t(41) = 0.726$, $p = .472$. The mean score on monitoring, however, was found to be significantly higher after instruction, $t(41) = 3.27$, $p = .002$. The mean score on evaluating was found to be significantly higher after instruction as well, $t(41) = 2.37$, $p = .023$.

The Determinants of Motivation

Based on the two focus sessions, two main determinants of motivation were found that influenced the amount of motivation among first-year students the most, meaning that the first-year students agreed that these determinants influence motivation within the educational program. The determinants were: guidance by the teachers and variation within the education.

Guidance by the Teachers

Availability of Guidance. When first-year students were asked what the reason of their motivational problems was after confirming they experienced a decrease in motivation within the program Software Development, two first-year students acknowledged that they get demotivated when they are having difficulties in finishing assignments, cannot find the answer online, and no teacher is available to answer the questions. The first-year students get stuck in the Classroom and do not feel motivated to work further.

Intensity of Guidance. Seven first-year students acknowledged that it does not motivate them when the teacher only corrects behaviour by telling the first-year students to get to work when the teacher notices the first-year students are not working in the Google Classrooms. What the first-year students think would motivate them is for the teachers to further ask why the first-year students are not working in the Google classrooms when the teacher notices, which may help the teacher get a clearer vision on problems the first-year students face.

Three students acknowledged that they do not feel motivated to work in the Google Classrooms because there are no clear goals or strict deadlines given to them by the teachers that pressure them to work hard. The first-year students think motivation would increase if they had strict deadlines. Two first-year students acknowledged that their teacher has given them a strict deadline before, with consequences of working through the break when the first-year students did not meet the deadline. The deadline motivated the first-year students to work hard, and the deadline was met.

Variation Within the Education

Variation in Content. Five first-year students said that the reason for the motivational problems was that the course that they were working on, which was the online HTML-CSS-course for all five students, was quite long and boring. The first-year students felt that, within the Classroom, lots of similar assignments were given. They felt like they eventually understood the assignments and were ready to move forward, but the content of the

assignments stayed the same. Receiving the same content decreased their motivation to work in the Google Classrooms.

Variation in Process. Another determinant of motivation among the first-year students is variation in process, meaning that there is variation in the way first-year students learn how to develop software. Eight first-year students acknowledged that, instead of only working individually in their Google Classrooms, the first-year students would like to have more group projects. An example of a group project mentioned that was motivating for the first-year students was the Game Jam, in which the first-year students had to work in groups, developing a game for two weeks. One first-year student also acknowledged that the classes for HTML-CSS were found to be very interesting and motivating, which are classes that were given by the teachers of the education of Software development due to the low productivity of the first-year students within the online course.

What is the Relation between the Age and the Development of Metacognitive Knowledge and Skills among First-year Vocational Students?

An overview of the results from all correlation coefficient analyses preformed can be found in Table 4. There was no relation between age and metacognitive knowledge before the instruction in metacognition. There was also no relation found between age and the difference in metacognitive knowledge after the instruction. There was no relation between age and metacognitive skills before instruction in metacognition, and no relation was found between age and the difference in the use of metacognitive skills after the instruction.

Table 4

Correlations between Age and Metacognition and Metacognitive Knowledge and Skills Before and After Instruction in Metacognition

	Before instruction			After instruction		
	r	***df***	***p***	***r***	***df***	***p***
Age and metacognitive knowledge	.21	48	.172	-.24	42	.134
Age and metacognitive skills	.23	48	.124	-.04	42	.820
Metacognitive knowledge and metacognitive skills	.40	44	.006	.57	44	.015

What is the Relation between Metacognitive Knowledge and Metacognitive Skills among First-year Vocational Students?

A positive relation between metacognitive knowledge and metacognitive skills was found in the first measurement of metacognition (see Table 4). With the second measurement of metacognition, there was also a positive relation found between metacognitive knowledge and metacognitive skills.

Discussion & Conclusion

Discussion

First year-students in vocational education struggle with autonomous behaviour. Reseachers posited that this might be due to their age and new learning environment (Fokkens-Bruinsma et al., 2020; Swaab & Swaab, 2015). However, the student-centred learning approach honored by higher educational institutions asks first-year students to be autonomous (Duchatelet & Donche, 2019). Moreover, there seems to be no well-developed

guidance in autonomy within vocational education (Kuijpers et al., 2006), showing the importance of retrieving information regarding effective guidance in autonomy in the context of vocational education, especially for first-year students.

Previous research showed that guidance in autonomy can be given by making first-year students aware of metacognitive skills and their importance (Apaydin & Hossary, 2017; Valcke, 2019; Veenman, 2015), training metacognitive skills in a learning task (Dedic, 2014; Pintrich, 2002; Veenman, 2015), and prolonged training (Mayer & Fiorella, 2014; Veenman, 2015). These findings were used to structure the intervention in the current study. After a pretest was conducted, the instruction in metacognition taught first-year students the concept of metacognition, as well as how to plan, monitor, and evaluate learning tasks. After the posttest, the practice materials were added to the learning environments of the first-year students, of which the effect could not be determined due to low use. As an alternative, a focus session was organized to form determinants of motivation within the learning process.

The Effect of the Instruction in Metacognition

Through previous research, it became clear that interventions in metacognition could have the effect of an increase in metacognitive knowledge (Dedic, 2014). This effect would occur when learners were made aware of the metacognitive skills, why to use these skills, and how to use these skills (Apaydin & Hossary, 2017; Valcke, 2019; Veenman, 2015).

In the current study, the instruction in metacognition did not show an increase in the use of planning, but it did show an increase in metacognitive knowledge, as well as an increase in the use of the metacognitive skills of monitoring and evaluating learning tasks. The higher use of monitoring and evaluating was not aimed for when designing the intervention, because previous research showed that instruction would not lead to behavioural change without additional support (Eshuis et al., 2019). Only the increase in metacognitive knowledge was expected. These results regarding the increase of monitoring and evaluating can be explained

by the positive, moderate relation between metacognitive knowledge and metacognitive skills found in the current study, replicating the results seen in previous studies. But that means that there should have been an increase in planning as well, meaning that this result came to be because of other choices made in the current study. The reason behind the different effects of the instruction was found in the presence of a teacher in the sessions of instruction in metacognition. Because the plan needed to be executed in a software development language, a teacher skilled in software development was present during the explanation of the skills of monitoring and evaluating, making it possible to connect personal interests and prior knowledge of the first-year students regarding software development to the new information regarding metacognitive skills (Tomlinson et al., 2003; Veenman, 2015). This shows the importance of the involvement of teachers with domain knowledge in the development of metacognitive skills. This involvement, therefore, should be higher when the instruction in metacognition is implemented in the future.

Future research regarding the instruction in metacognition should also measure the long-term effects of the instruction and, therefore, the importance of additional support. The relation between metacognitive knowledge and metacognitive skills shows how instruction only can have a positive effect on the behaviour of vocational students, contradicting the results of Eshuis et al. (2019) who showed the importance of additional support in vocational education to make sure student show certain behaviour. However, the current study did not cover the long-term effect of the instruction and could not determine the effect of the additional support (e.g., the practice materials). It may be that additional support is needed to make sure the effects of the instruction become permanent. Therefore, in future research, long-term effects of the instruction in metacognition must be measured to see if additional support is needed for behavior change among first-year students.

Future research can also include measurements on how the instruction in metacognition influences the use of metacognitive skills on individual level. While the current study showed an increase in the use of the metacognitive skills monitoring and planning after the instruction in metacognition, the current study did not include a measurement of how the instruction in metacognition influenced the use of metacognitive skills. Previous research showed the difference between production deficiency and availability deficiency and how learners with production deficiency need reminders to use already mastered skills, while learners with availability deficiency need to train skills to use them (Mayer & Alexander, 2011; Veenman, 2015). The current study did not show which students were reminded by the instruction to use metacognitive skills and which students learned new information on how to use metacognitive skills. For further research, it might be relevant to distinguish students with different types of deficiencies, differentiate the instruction based on different skills sets of first-year students, and see what effect differentiation has on first-year students. To make this possible, qualitative data can be collected by, for example, interviewing students and asking them to explain how to plan, monitor, and evaluate learning tasks. This way, students who need instruction in metacognition can be selected, and personalized instruction can be given that helps fill in the gaps these students have.

While the current study did not measure different deficiencies to differentiate, the current study did show that differentiation in instruction in metacognition does not need to be made based on age. Previous research showed that metacognition increases with age (Swaab & Swaab, 2015). Therefore, the development of metacognition caused by the instruction was expected to get smaller as age increased. This expectation was not met in the results. A possible explanation for this can be that the older first-year students were surrounded by younger peers, since the participating first-year students in the current study varied from age sixteen to 23. Adolescents are more likely to inhibit autonomy to satisfy the need to belong to

a group (Gauvain, 2005). Younger peers who are working together are also less likely to explain their strategies used or their thought processes than older peers. Because older first-year students do not see or hear younger peers use metacognitive skills, older first-year students might inhibit the use of metacognitive skills in the learning environment, satisfying their need of belonging (Allen & Loeb, 2015). Inhibition can also occur when the use of metacognitive skills is not approved by the group. A solution to inhibition of autonomy found in research is building relationships with adults, which helped reduce school failure and suspension rate up to 60%. This shows that not only do teachers need to be involved in instruction in metacognition to increase autonomy, but that involvement on a more personal level helps students become more autonomous as well.

The Results of the Focus Session

Due to low use of the practice materials, the effect of these materials could not be measured. As an alternative, determinants of motivation within the educational program were constructed. The main determinants of motivation were availability and intensity of guidance in the learning process by teachers, as well as variation in content and process within the educational program. Regarding the intensity of guidance, students acknowledged the desire to have the teacher ask them more about what they are working on, which can be related to monitoring (Pintrich, 2004; Veenman, 2015; Zimmermann, 2002). The desire for clearer goals can be related to planning. These results show that not only is involvement of and guidance by teachers necessary for increasing metacognitive knowledge and the use of metacognitive skills, but it is also desired by first-year students. The determinants of variation in content and process can also be related to metacognitive knowledge and skills since metacognitive knowledge is knowledge about different learning strategies (Veenman, 2015). If an education offers variations in the way knowledge and skills can be developed, students collect knowledge on which variations (e.g., learning strategies) work well for them and

which do not. Therefore, offering different ways of learning helps increase metacognitive knowledge, helping students to see what learning strategies are most effective and students are able to work with these strategies in their learning environment, with the consequence of forming autonomous learners.

Because of the importance of guidance in education to increase autonomy of first-year students, it is valuable that future research focuses on what personal guidance by teachers needs to look like in order to increase the autonomy of these students. Like previously stated, no well-developed guidance in autonomy is included in vocational education (Kuijpers et al, 2006). While the current study does show instruction that has a positive effect on autonomy, it does not give guidelines to teachers outside instruction while it is desired by students. Therefore, more research needs to be done to shape guidance for teachers in vocational education, giving them clear direction on how to shape autonomous students who can handle the more student-centred learning environment.

Future research should also focus on what effect offering variations of education has on the metacognitive knowledge and skills of students. While the current study did not offer variations of education, students might benefit from variations of education because they can see what ways of learning work best for them and can choose what way they want to learn. Therefore, the effects of offering variations on autonomy should be investigated in future research to see if this is a possible way for teachers of vocational education to shape autonomous learners.

Conclusion

The current study showed that instruction in metacognition can have a positive effect on metacognition of first-year vocational education students when it makes the students aware of metacognition, when metacognition is explained within the context of a learning task, and when teachers are involved in the instruction. The focus sessions showed how students want

teachers to pay more attention to what they are working on or why they are not working in their learning environment to stay motivated. The focus sessions also showed how students wish more variation in their educational program to be able to learn the way they want to learn new knowledge and skills. Therefore, the current study showed how, through instruction, vocational education students can learn to have more control over their learning process, but that they also want more control over their learning process within their educational program, with the help of teachers, to become autonomous learners.

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Appendix A

The Questionnaire 'Metacognitive Knowledge and Skills'

Vragenlijst over metacognitief bewustzijn

Hallo! Dit onderzoek gaat over hoe je te werk gaat als je een opdracht krijgt van het ROC. Dit kan het lezen van een tekst zijn of het maken van een opdracht. Graag wil ik jou vragen de stellingen in de enquête naar waarheid in te vullen. De antwoorden blijven anoniem. Er zijn geen goede of foute antwoorden. Het invullen van de enquête kost ongeveer 15 minuten. Door de enquête in te dienen, stem je ermee in dat uw informatie wordt gebruikt voor verder onderzoek. Wil je niet meedoen, dan is dat geen probleem. Dit onderzoek is volledig vrijwillig. Deze informatie wordt gebruikt om je opleiding te verbeteren. Mocht u na afloop nog vragen hebben over de vragenlijst, dan kunt u deze stellen aan Anne Beeftink (beeftinka@talnet.nl).

Voordat jij jouw gegevens invoert, is het belangrijk dat u toestemming geeft voor het gebruik van uw gegevens. Geef dit dan hieronder aan. Als je dit niet wilt, is dat prima en zijn er geen consequenties.

Geeft u toestemming voor het gebruik van uw gegevens?

- Ja
- Nee

Voordat je aan de enquête begin, wil ik jou vragen om enkele demografische gegevens in te vullen. Dit is belangrijk voor het onderzoeken van de antwoorden.

Leeftijd: _____

Geslacht:

- Mannelijk
- Vrouwelijk
- Wil ik niet zeggen

- Anders, namelijk: _____

Hoogste voltooid opleiding:

- VMBO-basis
- Havo 3
- VMBO-TL
- VMBO-KBL
- Havo (afgerond)
- VWO
- MBO (niveau 2)
- Anders, namelijk: _____

Nationaliteit: _____

Nu je een beetje een beeld hebt over wat metacognitieve kennis is, ga je nu jouw metacognitieve kennis in kaart brengen. Hieronder staan 5 stellingen. Iedere stelling gaat over of je weet hoe je een bepaalde leerstrategie kan inzetten. Geef aan in hoeverre jijzelf weet hoe je de beschreven leerstrategie inzet tijdens een leertaak door een score te geven tussen de 1 en de 100. Een score van 1 betekent dat je helemaal niet weet hoe je de activiteit doet en een score van 100 betekent dat je precies weet hoe je de strategie inzet. Het gaat dus over jouw kennis over de leerstrategie, dus er zijn geen goede of slechte antwoorden. Succes!

Item	Hoeveel punten geef jij jezelf?
1. Ik weet hoe ik mijn eigen doelen moet opstellen	
2. Ik weet hoe ik op verschillende manieren kan oefenen met het ontwikkelen van software	
3. Ik weet hoe ik mijn eigen progressie kan monitoren tijdens een leertaak	
4. Ik weet hoe ik mezelf op fouten kan checken	

5. Ik weet hoe ik mijn opdrachten van software development moet plannen	

Nu ga je verder met de verklaringen over metacognitieve vaardigheden. Er zijn in totaal 35 stellingen. Elke uitspraak verwijst naar een denkproces of activiteit die kan optreden tijdens een leertaak, zoals het oplossen van een probleem of het lezen van een tekst. Geef aan in hoeverre je de beschreven activiteit zelf doet tijdens een leertaak door een score te geven tussen de 1 en 100. Een score van 1 betekent dat je dit nooit doet en een score van 100 betekent dat je dit altijd en volledig doet. Succes!

Item	Hoeveel punten geef jij jezelf?
1. Regelmatig vraag ik me af of ik wel aan mijn doelen werk.	
2. Ik denk aan meerdere oplossingen voor een probleem voordat ik antwoord geef.	
3. Ik let op mijn tempo terwijl ik leer genoeg tijd te hebben.	
4. Ik denk na over wat ik echt moet leren voordat ik aan een taak begin.	
5. Ik weet hoe goed ik het deed toen ik een test afmaakte.	
6. Ik stel specifieke doelen voordat ik aan een opdracht begin.	
7. Ik vertraag wanneer ik belangrijke informatie tegenkom.	
8. Ik vraag me af of ik alle oplossingen heb bekeken als ik een probleem aan het oplossen ben.	
9. Ik richt mijn aandacht bewust op belangrijke informatie.	
10. Ik vraag mezelf af of er een gemakkelijkere manier is om dingen te doen na het voltooien van een taak.	

11. Ik controleer regelmatig of ik belangrijke verbanden begrijp.	
12. Ik stel mezelf vragen over de stof voordat ik begin.	
13. Ik denk na over meerdere manieren om het probleem op te lossen en kies de beste manier.	
14. Ik vat samen wat ik heb geleerd nadat ik klaar ben.	
15. Ik vraag anderen om hulp als ik iets niet begrijp.	
16. Ik kijk vaak naar het nut van leerstrategieën tijdens het leren.	
17. Ik concentreer me op de betekenis van nieuwe informatie.	
18. Ik creëer mijn eigen voorbeelden om informatie betekenisvoller te maken.	
19. Ik pauzeer regelmatig om te kijken of ik nog iets begrijp.	
20. Ik vraag mezelf af in hoeverre ik mijn doelen heb bereikt als ik klaar ben.	
21. Ik teken afbeeldingen of diagrammen om me te helpen begrijpen tijdens het leren.	
22. Ik vraag me af of ik alle opties heb bekeken na het oplossen van een probleem.	
23. Ik probeer nieuwe informatie in mijn eigen woorden te vertalen.	
24. Ik verander de leerstrategie als ik iets niet begrijp.	
25. Ik gebruik de logische structuur van een tekst om te leren.	
26. Ik lees de instructies zorgvuldig voordat ik aan een taak begin.	
27. Ik vraag me af of wat ik lees te maken heeft met iets dat ik al weet.	
28. Ik herzie mijn aannames als ik in de war raak.	

29. Ik organiseer mijn tijd zo dat ik mijn doelen het beste bereik.	
30. Ik probeer het studeren op te delen in kleinere stappen.	
31. Ik concentreer me op de algemene betekenis in plaats van op de details.	
32. Ik stel mezelf tijdens het leren vragen over hoe goed ik het doe.	
33. Ik vraag mezelf af of ik zoveel mogelijk heb geleerd als ik klaar ben met een taak.	
34. Ik stop en bekijk nieuwe informatie als deze niet duidelijk is.	
35. Ik stop en lees opnieuw als ik in de war raak.	

Je hebt de enquête afgerond. Dankjewel voor jouw tijd en inzet!

Appendix B

The Orientation Task before Starting a New Google Classroom

Oriëntatie

Je gaat beginnen met een nieuwe cursus: HTML/CSS. Voordat je met de opdrachten aan de slag gaat, ga je je eerst voorbereiden op de cursus. Dat ga je doen door eerst de cursus te analyseren, kijken naar wat je al weet, kijken naar de doelen en plannen. Kijk daarmee naar iedere week van de cursus. Kijk hoeveel opdrachten er zijn en wat voor een soort onderwerpen deze opdrachten bevatten.

Stap 1: analyse van de cursus

Je hebt nu misschien wel een idee wat je binnen deze cursus gaat doen. Schrijf in de box hier beneden wat je je opviel tijdens het scannen en wat je vanuit het scannen verwacht van de cursus.

Stap 2: voorkennis ophalen

Het kan misschien zijn dat je al iets weet over HTML/CSS of dat je misschien aan bepaalde dingen denkt toen je de cursus aan het scannen was die je kunnen helpen bij het begrijpen en onthouden van de stof die je in deze cursus gaat tegenkomen. Schrijf deze voorkennis hierbeneden in de box op.

Stap 3: kijken naar de doelen

In de studiehandleiding kwamen er doelen voorbij. Deze doelen maken duidelijk wat je aan het eind van de cursus moet weten en/of kunnen. De doelen zijn als volgende geformuleerd:

- Je kan omschrijven wat HTML is en waarvoor je het gebruikt.
- Je kan de DOM (Document Object Model) omschrijven en wat het belang van de DOM is.
- Je beheerst de basis van modern HTML.
- Je kan omschrijven wat CSS is en waarvoor je het gebruikt.
- Je beheerst de basis van modern CSS.
- Je kan jouw expertise van HTML en CSS (constructief) toepassen in een projectteam.

Terwijl je bezig bent met de opdrachten/secties, probeer dan deze doelen in zicht te houden en vraag je regelmatig af of je nog naar het doel toewerkt.

Stap 4: het maken van een planning

In de studiehandleiding staan niet alleen de doelen van de cursus, maar ook een planning die je kan aanhouden om op schema te blijven. Maar omdat het binnen de opleiding mogelijk is om te versnellen, kan je van deze planning afwijken. Het kan ook zijn dat je wat vertraging oploopt of dat je weet van jezelf dat deze planning niet werkt voor jou. Kijk naar de planning hier onderaan en de opdrachten/secties nog eens goed. Maak daarna in de tabel onder in een planning die duidelijk en haalbaar is voor jou. Hou rekening bij deze planning dat Javascript wordt meegenomen in combinatie met HTML/CSS en dat de onderdelen van Javascript geel gearceerd zijn.

Enkele tips om vorm te geven aan jouw planning van de cursus, maar ook aan de specifieke opdrachten die je gaat doorlopen:

- Kleinere taken zorgen voor meer motivatie
- Hou rekening met bepaalde principes binnen jouw werk (voorkennis)
- Kijk naar verschillende opties om het probleem op te lossen
- Kijk welke opties het beste bij jou passen (metacognitieve kennis)
- Plan taken in die naar jouw doel werken
- Geef een haalbare, maar uitdagende tijd die je besteed aan het afronden van de taken

	Theorie				Opdrachten	Praktijkopdracht	Toets
Cursusweek	**Udemy-cursus**	**Sections**	**Videos**	**Videotijd (minuten)**	**Opdrachten**	**Praktijkopdracht**	**Toets**
Week 1	Build Responsive Real World Websites with HTML5 and CSS3	2, 3, 4, 5	2-6 (section 2), 1-9 (section 3), 1-8 (section 4), 1-7 (section 5)	282	sectie 2, 3, 4, 5	continu aan werken	x
Week 2	Build Responsive Real World Websites with HTML5 and CSS3	5, 6, 8	8 - 23 (section 5), 1-2 (section 6) en 2 (section 8)	237	sectie 5, 6, 8	continu aan werken	x
Week 3	Advanced CSS and Sass: Flexbox, Grid, Animations and More	1, 2, 3, 4	1-3, 4-10, 12, 13, 23	131	sectie 2, 3	continu aan werken	x
	The Complete JavaScript Course 2021: From Zero to Expert!	1, 2	1, 2, 3, 5 + 6-16	121	sectie 1, 2	continu aan werken	x
Week 4	Advanced CSS and Sass: Flexbox, Grid, Animations and More	7, 8	67-71 + 89-104	183	sectie 7, 8	continu aan werken	x
	The Complete JavaScript Course 2021: From Zero to Expert!	2	17-30	160	sectie 2	continu aan werken	x
Week 5	x	x	x	x	AF	AF	Aanvragen en maken
	The Complete JavaScript Course 2021: From Zero to Expert!	3	31-41	140	sectie 3	continu aan werken	x
Week 6	The Complete JavaScript Course 2021: From Zero to Expert!	3	42 - 50	133	sectie 3	continu aan werken	x
Week 7	The Complete JavaScript Course 2021: From Zero to Expert!	5, 7	57, 58, 59, 60, 61 + 68 - 76	159	sectie 5 , 7	continu aan werken	x
Week 8	The Complete JavaScript Course 2021: From Zero to Expert!	7	77 - 86	158	sectie 7	continu aan werken	Aanvragen en maken
Week 9	Portfolio-project met Media en Vormgeving						
Week 10	Portfolio-project met Media en Vormgeving						

Mijn planning van HTML/CSS

Terwijl je bezig bent met de opdrachten/secties, probeer dan de gegeven tijd regelmatig in de gaten te houden en bedenk bij jezelf of je het afronden van de taak binnen de gegeven tijd afkrijgt.

Appendix C

The Evaluation Task after Finishing a Google Classroom

Evaluatie

Je hebt nu de cursus HTML/CSS afgerond. Dat zou betekenen dat je de doelen van de cursus hebt gehaald. De doelen van de cursus waren als volgende geformuleerd:

- Je kan omschrijven wat HTML is en waarvoor je het gebruikt.
- Je kan de DOM (Document Object Model) omschrijven en wat het belang van de DOM is.
- Je beheerst de basis van modern HTML.
- Je kan omschrijven wat CSS is en waarvoor je het gebruikt.
- Je beheerst de basis van modern CSS.
- Je kan jouw expertise van HTML en CSS (constructief) toepassen in een projectteam.

Nu ga je de doelen evalueren, maar je gaat ook beschrijven wat jij hebt om deze doelen (niet) te behalen.

Het evalueren van de doelen en jouw eigen kunnen

Beschrijf hieronder per doel of je het doel hebt gehaald, geef een voorbeeld waaruit blijk dat je dit doel hebt gehaald en beschrijf wat jij hebt gedaan waardoor je het doel hebt gehaald. Als je denkt dat je het doel niet hebt gehaald, beschrijf dan waarom dit doel niet is behaald en wat je de volgende keer anders zou doen om een gelijk doel in de toekomst wel te halen.

Je kan omschrijven wat HTML is en waarvoor je het gebruikt.

Je kan de DOM (Document Object Model) omschrijven en wat het belang van de DOM is.

Je beheerst de basis van modern HTML.

Je kan omschrijven wat CSS is en waarvoor je het gebruikt.

Je beheerst de basis van modern CSS.

Je kan jouw expertise van HTML en CSS (constructief) toepassen in een projectteam.