Designing a prototype e-learning module for the course ‘game-supervisor’ of the Royal Netherlands Football Association

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Title:	Designing a prototype e-learning module for the course ‘game-supervisor’ of the Royal Netherlands Football Association
Keywords	e-learning, game-supervisor, course design, training effectiveness, football

Summary

Research conducted by the Royal Dutch Football Association (KNVB) showed the need to introduce a game-supervisor to the new set-up of youth-football. In this study, a prototype e-learning module is designed and developed for the KNVB which aim to educate future game-supervisors. For the designing process, the model for educational design from Verhagen (ADDIE-model) is used. In the analysis phase, design requirements are set that form the foundation for the e-learning module. These requirements followed from three perspectives: representatives of the KNVB, possible end-users and existing learning materials. Video learning appeared to be a main aspect for the development of the e-learning module, so a context-specific version of the Demonstration Based Training model (DBT-model) was used as this model provides instructional features which influences attention, retention, reproduction, and motivational learning processes and their subsequent learning outcomes. By converting the design requirements and the instructional features from the DBT-model into concrete ideas for the development of the prototype, the base for the e-learning module was created. A prototype of the e-learning module was implemented and presented to six possible end-users who matched the age criteria of 12 years and older. These participants tested the prototype and gave formative feedback on how to improve the prototype. The feedback lead to recommendations for the further development of the e-learning module. This prototype e-learning module has provided a solid basis on which the final e-learning module for game-supervisors can be designed in the near future.

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Foreword

Before you lies the master thesis ‘Designing a prototype e-learning module for the course ‘game-supervisor’ of the Royal Netherlands Football Association’. I wrote this master thesis as a final part of the MSc programme Educational Science and Technology. During writing this master thesis, I learned a lot about how to design e-learning. I was fortunate that I could do my master thesis at the KNVB.

I would like to thank my supervisor Werner ter Avest for the assignment he has given me. A special thanks to Nicky Siebert for his support during the development of the prototype. I would also like to thank my first supervisor Henny Leemkuil for his patience and guidance during my master thesis.

I sincerely would like to thank my girlfriend Linda for her support during my study at the University of Twente. This study has presented me with many challenges which I would not have overcome without her.

Enschede, April 2019

Justin Rolefes

Introduction

Context and objective

The Royal Netherlands Football Association, also known in Dutch as Koninklijke Nederlandse Voetbal Bond (from now on KNVB) is the largest sports association in the Netherlands with more than 1.2 million members and more than 500 employees. As football association, the KNVB has the mission to make football attractive, accessible and enjoyable (KNVB, n.d.). Furthermore, the KNVB is responsible for the entire organization regarding the football matches, both in professional football and amateur football. The KNVB also provides training for referees, trainers and staff members of clubs.

Based on the report 'Winnaars van Morgen (Winners of Tomorrow)' (KNVB, 2016), the KNVB is currently working on the redesign of youth football for pupils between six and ten years old. This new set-up entails smaller football teams and smaller football pitches. The aim is to reduce the age differences within teams and to train the reaction speed of children because they interact with the ball more often. The KNVB wants to introduce a game-supervisor (KNVB, 2016) for this new set-up. A game-supervisor has different responsibilities than a referee, who previously had to lead matches. The game-supervisor must teach the players the rules, while a referee is only concerned with complying with the rules. There will be a more didactic task waiting for the game-supervisor.

The KNVB wants a training to be developed for the tasks a game-supervisors has to perform. The KNVB prefers a blended-learning training, where the participants learn in an online module what the rules are and how they should behave on the football pitch, while during classroom teaching the participants learn how to teach the children to follow the rules. Furthermore, during these classroom teaching hours, the participants will practice on the football pitch.

This research focuses on the development of a prototype e-learning module for game-supervisors in which they will learn what the rules are and how they should behave on the football pitch. It should be mentioned that this study is done on behalf of the KNVB, implying that decisions regarding the development of this prototype are made in line with the vision of the KNVB.

Design approach

In order to design and develop the e-learning module for game-supervisors, Verhagen's model for educational design (see figure 1; 2000) is used. The e-learning module will be developed according to the five important design phases of this model, namely: Analysis, Design, Development, Implementation and Evaluation. This model emphasizes the need to continuously evaluate and implement during the design process. Therefore, Verhagen's model is iterative; there is constant feedback between the different steps. Hereby, the final design can be improved during the process and the success of the implementation can be ensured.

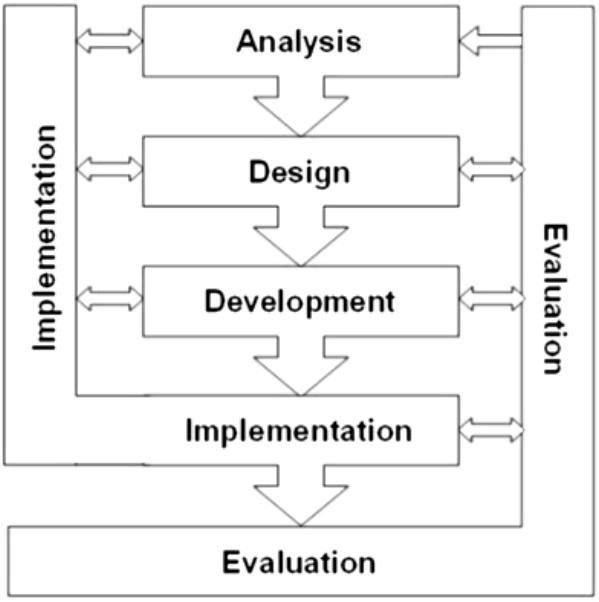

Figure 1. Verhagen's model for educational design (2000)

The five design phases are used as a guideline in this research. First, in the analysis phase, focus groups are conducted to explore the needs and requirements according to the different stakeholders, namely the end-users of the e-learning module and the representatives of the KNVB. Furthermore, the current training for referees has been analysed in order to explore which educational content (e.g., game rules) can be used in the training for game-supervisors. The analysis is the most important step of the design approach because it leads to design requirements.

The analysis phase showed that the KNVB would like to develop an e-learning module wherein video-learning plays an important role. Therefore, it was decided to use the Demonstration-Based Training model (from now on DBT-model; Grossman et al., 2013) in the design phase. The DBT-model can help guide the systematic development of demonstration-based learning material, because it provides training design characteristics for developing demonstration-based training, such as with video material. The DBT-model has its roots in Bandura's Social Cognitive Theory (1986) and is, therefore, based on four interlinked learning processes: attention, retention, reproduction and motivation. These learning processes can occur simultaneously and are connected to each other (Bandura, 1986). Furthermore, the learning processes result in cognitive, behavioral and effective learning outcomes. The training design characteristics of the DBT-model influences the four learning processes and, therefore, the various learning outcomes (Grossman et al., 2013). However, it has been decided to slightly adapt the DBT-model with context-specific instructional features in order to facilitate the foregoing learning processes. The last step in the design phase was to link the design requirements with the design characteristics of the DBT-model. By linking these, design principles have been formulated that have determined the decisions in the development phase. Hereby, a prototype e-learning module has been developed that incorporates the needs and requirements obtained in the analysis and design phase.

Lastly, formative evaluation is conducted during the whole process. Formative feedback is obtained from five representatives of the KNVB, who were also present in the focus groups, in order to refine the prototype. Also, the prototype of the e-learning module is presented to six possibly end-users, who were also present in the focus groups. These end-users gave formative feedback as well. By constantly requesting feedback from the stakeholders, an effort is being made to develop an e-learning module that can be implemented effortless. Since a prototype e-learning module has been developed, there is no actual implementation yet.

Analysis

Overview of the analysis

The analysis phase contains focus groups with representatives of the KNVB, focus groups with the end-users, analysis of existing learning materials and an analysis of existing literature regarding training design models. Figure 2 shows an overview of the analysis phase.

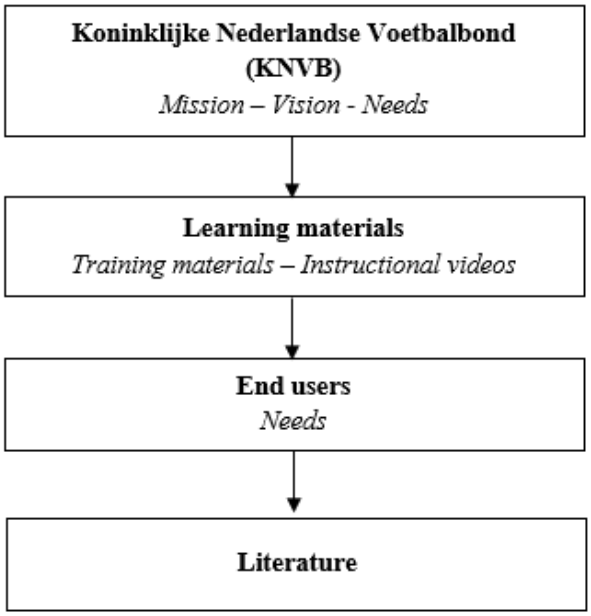

Figure 2. Overview of the analysis

First of all, a focus group has been composed with representatives from the KNVB. Four meetings of each one and a half hour were organized. People with different positions within the KNVB were present, such as the head of training development, the coordinator referee training, and a referee. For a complete list of attendees including name and function, please refer to Appendix A. In this focus group, the mission, vision and needs of the KNVB is explored. These meetings resulted in several design requirements.

Second, the existing learning materials have been analysed. Within the KNVB, a very wide range of learning material for referees exist, including instructional videos. Is has been analysed which existing learning material can be used in the design of the e-learning module.

During the focus group with representatives of the KNVB, decisions were made about what the end user group of the e-learning module will be. The end user group consists of everyone over the age of 12 who is affiliated with a football club and wishes to become a game-supervisor. A focus group with some end-users has been organized in order to identify the needs of the end-users with regard to the e-learning module. This group is selected by convenience sampling.

Finally, existing literature with regard to models about designing training has been analysed. Based on this analysis, it was decided to use the Demonstration-Based Training Model (Grossman et al., 2013) as a framework in which the e-learning module is developed.

Analysis of the context

A focus group was held with representatives of the KNVB. In this focus group, the mission, vision and needs of the KNVB with regard to the development of the e-learning module is discussed. Prior to the focus groups, main themes were formulated that should be addressed during the meetings. These main themes are: end user group of the course, theoretical content of the course, and didactic approach. This paragraph ends with a number of design requirements.

Fundamental idea

The motto of the KNVB is: 'football to love'. One of the main aspects that arose from the focus group, is that pupils should have more fun during the game. To accomplish this, a new game set-up is created. With this new game set-up, there is more room for self-directed learning, with less interference from an adult. The game set-up consists of smaller teams and smaller football pitches. Furthermore, the referee will be replaced by a game-supervisor. In order to use this new game set-up, a course has to be developed to train game-supervisors.

Vision

The KNVB wants the pupils to learn in a self-directed experiential situation. Self-directed learning in a experiential situation means that the pupils can gain knowledge about football by coming into certain situations in which they themselves have to come up with solutions. This self-directed learning must be achieved by letting the game-supervisor interfere less in the game or match. The intention is that pupils first think for themselves whether the game still goes according to the rules. If not, they can intervene themselves. If a situation occurs in which the pupils do not make the right decision, the game-supervisor will interfere. The game-supervisor will then explain the rules himself and then check whether every pupil has understood it.

To become a successful game-supervisor, some aspects of the participant of the course are important according to the KNVB: the participant loves football and is enthusiastic to take a course to become game-supervisor. He or she has the sense of responsibility to guide a football match. Lastly, the participant likes to work with children in the age of eight to ten years.

The KNVB prefers a blended learning form, in which students learn the necessary theoretical knowledge by means of an e-learning module and the practical skills by means of a classroom and practical setting. There will be a decrease in investment in time and money by both the KNVB and the clubs, if part of the course can be followed online. Furthermore, in the classroom setting participants

can discuss the subject matter with each other. According to the KNVB, the subject matter will then be remembered in a more efficient manner. In addition, the KNVB thinks it is very important that not only the theoretical knowledge is communicated effectively, but that the participants of the course also enjoy following the course.

During the focus groups, there was also brainstorming about some learning activities that the KNVB deems important. The following five learning activities are considered important according to the mission and vision the KNVB presented:

- Experiential learning: learning by doing;
- Reflective learning: thinking about actions from yourself and others;
- Collaborative learning: learning from each other;
- Observational learning: learning by example;
- Theoretical learning: learning by attaining more theoretical knowledge.

Needs

The first thing discussed in the focus groups with representatives of the KNVB, was the target group. It was determined that the target group of the course will consist of anyone with the age of 12 years or older, who is registered with a football club and has the ambition to follow the course. Because the course is on a voluntary basis, this implies that participants will be motivated to follow this course and complete it. A broad target group is chosen because there is a need for a lot of game-supervisors because there are more matches that need to be led due to the fact that the teams will become smaller in numbers. The course must be available nationwide, for both large and small football clubs. It differs per football club who teaches the pupils. Sometimes young people between the ages of 12 and 18 teach the pupils, but sometimes adults do. Because the KNVB has neither rules or supervision on this matter, the course must be accessible to this entire audience. An additional thought behind this is that a broader target group will result in more game-supervisors. The entire course, including the e-learning module, must contribute to the professional appearance that the KNVB wants to convey. In addition, this course must position the KNVB as the expert when it comes to knowledge of football. With this new course, a blended learning form is chosen. This means that an online course is combined with a classroom meeting on location (selected by the KNVB), where course participants meet. However, this meeting is more focused on experiential learning than on imparting theoretical knowledge.

During the focus groups, there was a lot of discussion about the responsibilities of a game-supervisor. The basic position of the game-supervisor is alongside the football pitch and he moves with the game. When the game requires it, the game-supervisor can move into the football pitch. The game-supervisor monitors the game rules, explains the rules and will only correct in case of indistinctness and makes a decision by means of a whistle. The game-supervisor makes an important contribution in terms of sportsmanship and respect, but also in the game development and the enjoyment of the game. The

game-supervisor ensures fun during the match, for example by taking honest decisions and ensuring structure and discipline.

In addition, the appearance and content of the e-learning module has also been discussed during the focus groups. In the e-learning module, the house style of the KNVB must be taken into account. For example, the colour orange should be used and the logo of the KNVB should be visible. The layout of the e-learning module must be attractive and user-friendly. User-friendliness is important because it may stimulate the participants to engage with the course. The e-learning module must also be interactive. In order to achieve this, the KNVB want to use video material. Another form of interactivity is user control. The students themselves need to have control over the learning pace. They do not want the e-learning module to become a 'static' digital book. The content of the already existing course "pupil referees" contains content that may be used for the e-learning module. Especially the video materials that are used in this course were opted for possible reuse. However, this already existing course also contains a lot of material that cannot be used for the course game-supervisor. In the focus group, it has been decided that the KNVB will deliver the already existing learning materials, then the researcher will select appropriate content that can be reused for the new course (see paragraph 'analysis of existing learning materials'). Furthermore, the entire didactical approach will change. In the "pupil referees" course, a KNVB member comes to the club to teach in a classroom setting. During this course, textbooks were used. This will be different in the new course. The theory has to be learned through the use of the e-learning module. The e-learning module must be concluded with an online test regarding the rules. Students need to pass this test in order to participate in the continuation of the course. When the prototype is ready, an external agency will look into the realization of the "game-supervisor". The prototype then serves as the basis for the external party to finalize the development of the course. This means that the external party will be responsible for putting the e-learning module to practice.

Design requirements

There are a number of design requirements that flow from the analyses of the needs from the KNVB. Firstly, it is important that the e-learning module should allow volunteers to learn the rules of the game and the role they have to perform. Secondly, the e-learning module should be an experience for users in which they learn with different learning methods. Thirdly, the e-learning module should position the KNVB as experts in the field of football education. Therefore the course has to be created in the same style as other courses of the KNVB. The e-learning module should have relevant short instruction (animation) videos to benefit the students. It is important that the user has control over the pace an time when the video has to be played. Another important aspect about the e-learning module is that it has to contain active learning elements. But the most important aspect is that the e-learning module should be aimed at everyone who wants to participate in the course.

Analysis of existing learning materials

The KNVB has made the existing teaching material for the "pupil referees" course available to be used. This course consists of two classical teaching days. During the first day, attention is paid to the rules and behavior on and off the field, such as contact with the other party, trainers, parents and players. During the second day of classes, attention is paid to the referee's position in the field and situations in which there the referee has to whistle. This day ends with a theory test about the subject matter covered. Prior to the course, the participants receive the "pupil referees" booklet so that they can learn more about some aspects if necessary. In addition, this booklet serves as a reference book. The difference with the new course will be that the course participants can find the course material on the internet. The course material remains accessible even after completion of the course, so that they can use this as a reference work.

During the first day of classes, the first thing pupils will learn are the game rules. The rules that are used for the "pupil referees" course can generally no longer be used for the "game-supervisor" course. Due to the new design of youth football, it is necessary that other, more suitable rules are formulated. That is why the KNVB is going to formulate new rules for the "game-supervisor" course. The newly formulated rules can be found in Appendix B (note: this content is delivered by the KNVB and therefore in Dutch).

On the other hand, the teaching materials for dealing with the counterparty, trainers, parents and players can be used for the course "game-supervisor". Dealing with anger of trainers, parents or players is an important element in this. In the new forms of competition, trainers, parents and players cannot express any kind of anger towards the game-supervisor, opponents or their own players. If this is the case, the game-supervisor will have to act against this. In the course "pupil referees" a number of cases are described in which there are angry bystanders. The course participant must indicate how he or she would deal with this situation. Tips are also given on how to act in this situation. These cases can be reused for the new course.

Finally, on the first day of the course "pupil referees" attention is paid to the fun that the pupils experience during the game. The pupil referee should have a positive attitude and ensure a good atmosphere, so that every player feels comfortable on the pitch. This is also important for the game-supervisor. This content is therefore certainly important for the course "game-supervisor". However, the text will be adapted to fit within the new context.

During the second day of the course "pupil referees" it is explained where you position yourself, as a referee, on the pitch during a match. In addition, it is explained in which situations you should and should not whistle. In the new course the game-supervisor has a totally different position in the field, therefore this teaching material cannot be reused. The second day of classes ends with a written theory test. This theory test will not be reused. A new digital theory test is being developed for the course "game-supervisor". This is done because the old theory test is based on other rules and information than the future game-supervisors should know.

Design requirements

There are a number of design requirements that flow from analysing the existing training material. Firstly, the e-learning module should have a digital examination in order to test if the learner has the necessary knowledge to continue with the course. Secondly, the e-learning module should provide examples, of different situations, in which interaction with multiple stakeholders takes place. Another important aspect is the position of the game-supervisor, the e-learning module should provide information about this. The language of the e-learning module has to be understandable for children twelve years of age.

Analysis of the end-users

In four current referee courses, input for the e-learning module was asked. After the course was completed, students were asked how they would like to learn in the new e-learning environment for the "game-supervisor" course. During these focus groups, attention was paid to the difficulty level and in which form (reading, video, game etcetera) the participants would like to learn. The average age in these focus groups was between twelve and eighteen years.

From these four focus groups it emerged that participants like to learn by actively working with the material. An example of this is that a number of participants indicated that they would like to learn through a game or different scenarios about when and how they have to react to certain situations during a match.

Another important element about their learning preferences was that participants stated that they like to learn through the use of video material. Participants indicated that they like to watch a video rather than having to read a long text. The conversations revealed that reading a text is perceived as boring compared to watching a video.

On the other hand, some participants indicated that it could be very useful to be able to read some information. Especially when there are a lot of rules to be learned. Then it is convenient to have all the rules in one screen. One participant said the following: "Especially a summary of the game rules is useful, because you do not have to watch the whole movie again".

Some participants indicated that the e-learning module should not be too difficult. With this they meant both the theory and the examination of the course. The theory that participants have to learn should not be too much, everyone must be able to learn the theory easily. Also, the final test should not be too long and the questions should be formulated at a basic level.

The design of the e-learning module was also discussed. The e-learning module should have an attractive look. Users should be enthusiastic to learn when they see the design of the e-learning module. It is important that the users immediately see that this course is about football. According to the participants this can be accomplished by adding a lot of imagery.

Design requirements

There are a number of design requirements that flow from analysing the needs of the end-users. Firstly the e-learning module should provide active learning elements. Suggestions were to insert some scenarios where students have to make decisions. Another important aspect is video, the e-learning module should provide video learning material. There should also be the ability to read information when a learner feels the need for it. The entire module should fit with the competency level of the students. Finally, the e-learning module should be attractive and easy to use.

Conclusion

The vision and needs of the stakeholders and an analysis of the existing learning materials was analysed, resulting in different design requirements that affect the e-learning module. See Table 1 for the design requirements.

Table 1. *Design requirements*

Design requirements as a result of focus groups with KNVB representatives
The e-learning module…
1. …should allow volunteers to learn the rules of the game and the role they have to perform;
2. …should be an experience in which students learn with different learning methods;
3. …should position the KNVB as experts in the field of football education;
4. …should be in the same style as other courses of the KNVB;
5. …should be aimed at everyone who wants to participate in this course;
6. …should have relevant short videos to benefit the students;
7. …should provide both instructional video as well as active learning elements;
8. …should provide user controls.
Design requirements as a result of analysing existing learning materials
The e-learning module…
9. …should have a digital examination;
10. …should provide examples of different situations concerning the interaction with different stakeholders;
11. …should use language that is understandable for children twelve years of age;
12. …should teach users the position of the game-supervisor.
Design requirements as a result of focus groups with potential end-users
The e-learning module…
13. …should provide active learning elements;
14. …should provide some sort of video learning;
15. …should provide the possibility to reread information when needed;

16. …should fit to the competency level of the students;
17. …should be attractive and easy to use.

The design requirements provide guidelines for the content and layout of the e-learning module. Furthermore, the design requirements show that the use of video material is important in the development of the e-learning module. Therefore, the DBT-model is introduced in the next chapter.

Design

In the design phase, the design principles are described. The design principles are supported by the design requirements and the training characteristics of the DBT-model (Grossman et al., 2013). The design principles determine future decisions in the development phase.

Demonstration Based Training-model (DBT-model)

The DBT-model (Grossman et al., 2013) is used because video-learning will be an important aspect of the e-learning module. Although it was possible to opt for other models, it has been deliberately chosen to use the DBT-model because this model connects instructional features, learning processes and learning outcomes. Other models, such as the "Felder design model" (Schneider et al., 2006), do not provide clear guidelines for the development of demonstration-based learning materials. The DBT-model provides instructional features which influences attention, retention, reproduction, and motivational learning processes and their subsequent learning outcomes. Attentional processes focus on directing the attention of the student to the correct information (i.e., the information they have to learn). Attentional processes are thought to ensure that training content is transmitted to the short-term memory. Retentional processes focus more on transferring information to the long-term memory (Taylor et al., 2005), by deep-level processing of training material. Reproduction processes focus on practicing the behaviours within the context of the training environment. This provides the opportunity to correct and reinforce the behaviour before the behaviour is applied in a real-life setting. Motivational processes encourage students to focus on learning and practice the study material. A student has to be motivated in order to draw correct conclusions, acquire correct information and transfer trained behaviours to real-life settings. The DBT-model is user-friendly and easy to adjust. In this research, an adjusted version of the DBT-model will be used, in which context-specific key concepts are implemented to facilitate the four learning processes (i.e., attention, retention, reproduction, and motivation). See Figure 3 for the adjusted DBT-model.

Attention process

Students have to be able to accomplish their learning objectives by attending to the useful information. In order to direct the way of thinking of students, it is useful to use *instructional narrative (A1)*. This concept can be used to explain the underlying reason of the specific instructions (Grossman et al., 2013). According to Smith and Ragan (1999), it is important to explain why a specific skill is important. This will help the student to focus his/her attention towards the skill they have to learn. In order to reduce the chance of cognitive overload, the *minimalism principle (A2)* of van der Meij (1995) will be used. This principle states that only relevant information should be presented.

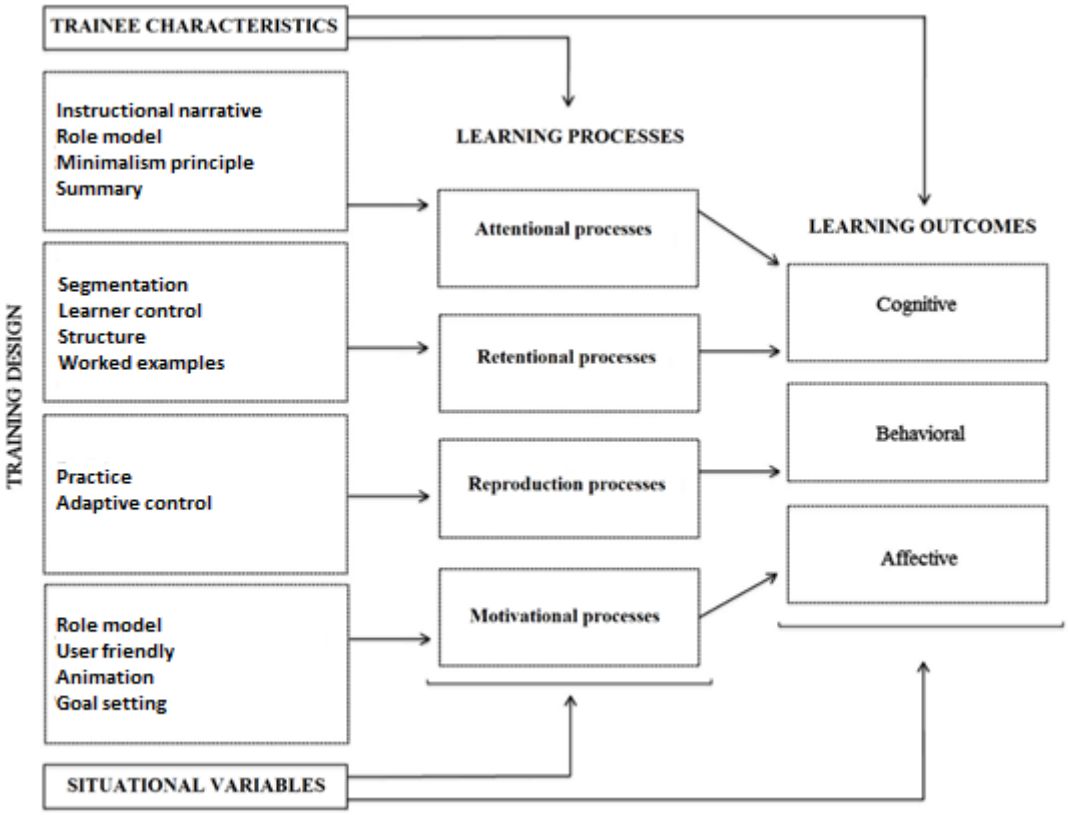

Figure 3. Adjusted model of Demonstration-Based Training (Grossman et al., 2013)

A second important feature of the attention process are *summaries (A3)*. Summaries are short descriptions of the learning task that needs to be performed. By adding summaries, the students will get an overview of the important aspects (Li, 2012). Therefore, video instruction and summaries provide students with multiple channels to learn. Students can learn through auditory and visual channels. When combining both channels it means students need to organize and integrate both channels to combine them into one meaningful learning task (Mayer, 2001). When instructions are being presented in video's it is always good to provide the same information in a summary because students learn better from words and pictures than words alone (Mayer, 2001).

Retention process

Instructional features for retention aim to facilitate deep-level information processing (Grossman et al., 2013). In order to increase retention, the user should be able to learn in their own pace. This can also be called segmentation. When a complex task is introduced, the learner might struggle to obtain this information in a continuous flow. However, when this information is presented in small steps (segmentation) than the learner can control his or her learning pace. Mayer (2001, p. 46) states that "students understand multimedia explanation better when it is presented in learner-controlled segments rather than as continuous unit". This can be done by adding a pause button, rewind and fast forward button, pace control or by splitting the video into small steps. When an instruction is carefully

constructed with the use of segmentation, deep process learning is facilitated. This can be confirmed by Lusk et al. (2009), who proved this in their research.

Learner control is another instructional feature for retention. Learner control implies that a student has control over how, why and when the learning takes place. According to van der Meij (1995), the instruction should fit the needs of the students. Although this will give the students a lot of freedom in how they learn, there is still a need for structure and guidance (Salas et al., 2012).

Another feature is worked examples. Worked examples contain topic formulation and detailed process description on how to solve these problems. When a student is working out such an example he or she is busy with processing information that is needed to perform the task accordingly, this will serve deep-level information processing. This will allow students to get familiarized with the role they are going to perform, which will not only stimulate retention but also stimulates motivation (Keller, 2008).

Production process

Instructional features for production have to provide the student with chances to perform their new role (Grossman et al., 2013). *Practice (P1)* is the most important feature. It is important for future game-supervisors to link their learning with the role they are going to perform on the field. Therefore, the assignments should refer to situations that are expected to happen (Cercone, 2008).

Adaptive control (P2) is used to facilitate this practice learning process. Adaptive control is the process where students have the ability to use multiple instructional materials in order to reach the same results (DeRouin, 2004). For example, if a student answers all the questions correctly, he/she will get harder questions.

On a side note, not every competency that is part of a game-supervisor's tasks can be learned by using an e-learning module. This can be confirmed by the research done by Lemyre et al. (2007). In this research, recreational youth sport referees were asked how they learn to lead a game. Most of them answered that although they followed a module, the real learning took place when they were experiencing the role on the field. Because a lot of the decisions a referee makes is based on estimating situations, this is nearly impossible to learn in a module alone (Farres, 2004).

Motivation process

Features regarding motivation need to encourage students to acquire and apply the learning material (Grossman et al., 2013). In order to motivate students to learn, a *role model (M1)* will be used in the e-learning module. Including a visible personal trainer who will guide students throughout the learning process can improve learner engagement (Morain & Swarts, 2012).

User-friendly (M2) is the second motivation feature. It is necessary to use polite wording in instruction material (Clark & Mayer, 2008). The instructor should speak to the students in an informal manner. By doing this the learning material becomes more user-friendly.

Animation *(M3)* is the third feature for motivation processes. Using animation videos will result in higher motivation to learn (Barak, Ashkar & Dori, 2011). Animation is a tool to make abstract tasks concrete. This will improve the understanding of the specific skills or information presented in the animation (Lee, Kazi & Smith, 2013)

Training design

To add these elements to the e-learning module, these elements had to first be translated into concrete ideas. In this section the translation of these elements was made..

In the e-learning module *instructional narrative (A1)* was used. The movies that were developed should enable the learner to alter their perspective on youth football. Therefore during the movies the alternative way of leading matches was the main focus. Students had to understand why this change was needed, therefore this movie showed the benefits of a game-supervisor. A way to change the way students make decisions was to allow them to make a decision and to see what the results of those decisions were. This was done by adding scenario-based learning to the e-learning module. By adding this the students learned from their own actions. The scenario-based learning was one of the assignments of the e-learning module. Instructional narrative was a way to incorporate design requirements 1, 2, 4, 5, 6, 7, 8, 11, 14.

Throughout the entire e-learning module the *minimalism principle (A2)* of Van der Meij (1995) was used. Therefore the lay out of the e-learning module was minimalistic and only relevant information was given. This gave structure during the e-learning module. Minimalism principle was also a way to incorporate design requirement 2.

After every video a *summary (A3)* was given to the students. However, this summary was optional. Therefore, the summary was not visible directly. Students could click on the summary button and where able to read the most important aspects of the video. This also stimulated the rate of control a learner had during their encounter with the e-learning module. Summary was also a way to incorporate design requirements 5, 8 and 15.

Segmentation (R1) was another important aspect that was used throughout the e-learning module. Instead of putting every information in one video the information was divided in different short videos containing information about the different phases of the football game. Therefore, in the e-learning module students learned the information in small steps. In the videos, there was an option for the students to pause, rewind or replay the video. Every phase had its own video, summary and assignment(s). Segmentation was also a way to incorporate design requirements 2, 10, 16 and 17.

Learner control (R2) was important to add to the e-learning module. Throughout the entire e-learning module the learner was free to navigate everywhere. However, the layout provided a *structure (R3)* for students who were in need of some more guidance. This stimulated the freedom a user felt when using the e-learning module. Learner control was also a way to incorporate design requirement 8. Structure is a way to incorporate design requirements 2, 5, 16 and 17.

Throughout the e-learning module *worked examples (R4)* were used. This helped students to convert the information into useful practices. Worked examples provided the students with an example on how to act during situations. Mostly, this was done by adding videos with a certain scenario in it. Based on these scenarios students could see how others react in similar situations and might learn from it. Worked examples was a way to incorporate design requirements 1, 10 and 12.

Students had to be able to *practice (P1)* with the information presented. This was done by adding assignments throughout the e-learning module. These assignments consisted of simple point and click, drag as well as assignments with scenario's in which students had to make decisions. All assignments were created to help the student to perform the role of game-supervisor. Practice was also a way to incorporate design requirements 1, 2, 9, 10, 12, 13 and 16.

Adaptive control (P2) was used in the e-learning module to add extra learning material for those who wanted to learn more about certain topics. This was done by adding somewhat more difficult assignments. Adaptive control was a way to incorporate design requirements 2, 5 and 16.

Another important aspect for the e-learning module was making use of a *role model (M1*). The KNVB chose Kevin Blom as the referee who was going to be the role model. Kevin Blom participated in making instructional movies for the e-learning module. However, the KNVB also wanted to use animation in the e-learning module. A role model was a way to incorporate design requirement 3.

The e-learning module had to be *user-friendly (M2).* The language that was used throughout the e-learning module had to be created with the target group in mind. The age of the target group could vary between 12 and 67. Therefore, simple wording was used so that everyone could understand the information that was presented in the e-learning module. This also stimulated motivation. User-friendly was also a way to incorporate design requirements 5, 11 and 17.

Animation (M3) videos are assumed to motivate students to learn the necessary skills (i.e., rules of the game). Animation is also a way to incorporate design requirements 1, 6, 7 and 14. However, real-life videos are used as well in the e-learning module, since it was easier to implement the role model (i.e., Kevin Blom) in these videos. Furthermore, the real-life videos were more cost-efficient.

Development

This chapter describes the development of the e-learning module. Choices made during the development of the e-learning module are based on the design principles as described earlier in the previous chapter.

Prototype

The prototype was created in Articulate Storyline 2, a tool to build interactive e-learning content. The design principles formed the basis for the development of the prototype. Segmentation was applied so that students receive the theory in a systematic way. Therefore, the e-learning module consists of six different phases. In the first phase, an introduction was given with regard to the definition of game-supervisor and the content of the e-learning module. In the following three phases, the student was educated about the task of a game-supervisor before the match (phase 2), during the match (phase 3) , and after the match (phase 4). These phases contained its own videos, summaries, worked examples and assignments. The fifth phase in the e-learning module consists of the digital examination about the theoretical content. After finishing the exam, the final phase of the e-learning module explained what students could expect during the practical part of the course.

Construction of the e-learning module

This section explains how the different phases have been constructed. Reference is made to the design requirements as formulated in the previous chapter. During the creation of the entire prototype, the age of the target group, namely 12 years or older (DR 5) was taken into account.

Construction of phase 1: Introduction

Before students could enter the digital environment, they had to fill in their name, age, contact details, football club, and KNVB ID number. If students did not yet had a KNVB ID number, then they could make a request for this on the website of the KNVB before they entered the course.

Figure 4 shows the layout of the e-learning module. This layout fits the corporate identity of the KNVB (DR 3 and 4). Because the KNVB logo is orange, it has been decided to use the colour orange as the main colour throughout the e-learning module. This is reflected in the buttons that were used and the background colour of the text boxes. A football field has been chosen for the background, because this is immediately associated with football (DR17). After the demographic variables were filled in, the students could continue by clicking on "next", this brought the students to the main menu (see figure 5). The language of the e-learning module had to be easy to understand (DR 11).

Figure 4. Demographic variables

The table of content of the e-learning module was visible in the main menu. The content was divided into six different phases (R1). Namely, introduction, before the match, during the match, after the match, examination and continuation after the e-learning module. This distribution was visible in the main menu, where space was left between the different phases. The space between the different phases also gave structure (R3) for the students. Another way to structure the e-learning module was to add a green checkmark when a student had completed a specific topic. This ensured that students did not follow the same topic twice. Some phases deal with multiple topics, as demonstrated by phase 2 (i.e., 'before the match') in which the organization, rules and manners are handled. In this way, the information was provided to students in manageable segments.

Figure 5. Content

In the introduction, the role of the game-supervisor and its urgency was explained (A1). The size of the field, the size of the goals, the size of the ball, the playing time and the number of players in a team had to change as a result of the introduction of the game-supervisor. This is explained in an animation video (M3, DR 1, 6, 7, 12 and 14). In the animation video, the topic was visible on the left hand side of the video. In figure 6, the new number of players was the first topic that was introduced. This became visible because the icon became orange and larger in the animation video. The information that was told in the animation video was also elaborated in a summary (A3) under the video. When students wished to read

this summary, they had to press a button under the animated video (DR 15). However, this was not mandatory. The animation video could be paused, fast-forwarded, rewound and re-played using the buttons in the video (M2, DR 8, 17). The user controls became visible when the mouse was moving over the video (figure 6). The length of the animation video was short since only relevant information was presented to the students (A3). The video lasted one minute and forty-four seconds.

Figure 6. Introduction animation video

Construction of phases 2, 3 and 4: Content of the e-learning module

In the second phase of the e-learning module, preparations for the match was the central topic. This phase is divided into three parts: the organization, the game rules and the social codes of conduct on and around the football field. Like any chapter, these three chapters also had the same structure.

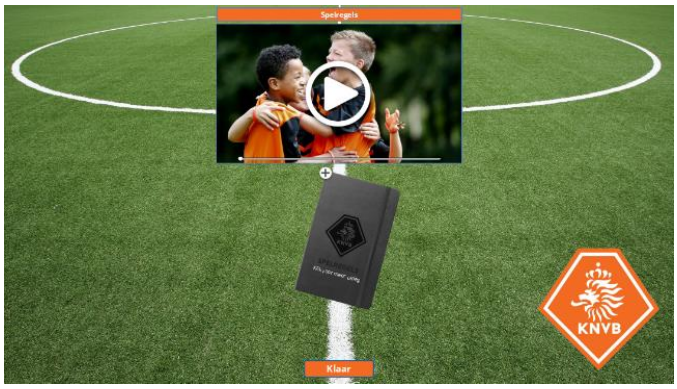

Figure 7. Rulebook

Namely, a video containing the information related to the subject (DR 6, 7, 8, 13 and 14), a summary of the information in the video (A4) and assignments. However, the summaries of the videos was presented in different ways. Sometimes, this was a textual translation of the video. Another times, it was an interactive element in which students could click on different icons to learn the information (DR 2 and 13). An example of this is the closed book (see figure 7 on previous page). Students could open this book (see figure 8) by clicking on it. The book explained the rules of the game. Students were able to

learn all the rules by turning the pages. Students were free to choose how they wanted to learn the information. This could be done by watching the video or by reading the summary of the video (R2).

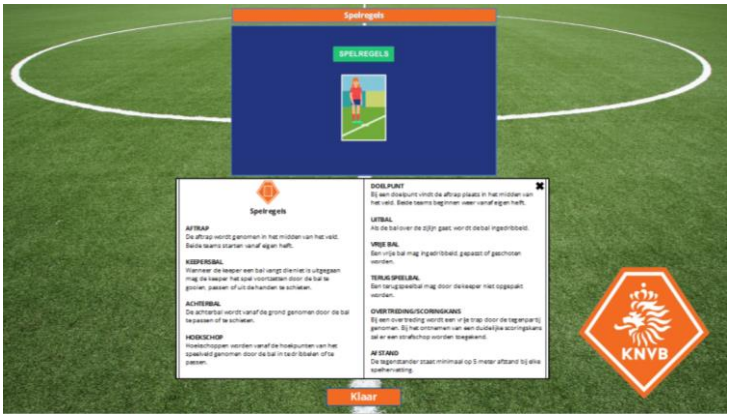

Figure 8. Rulebook open

There were also assignments available that students could make without watching the video or reading the summary. The assignments contained multiple choice questions, point and click questions and scenarios (R4) in which students had to make their own decisions, these assignments became more difficult the further a student got (P1 P2, DR 7,10 and 13). A combination of all three learning methods was also possible. In contrast to the introduction, not all subjects contained animation videos. In fact, some videos were recorded in real-life. In the real-life videos, a role model (M1) explained the information to the students (see figure 9).

Figure 9. Role model

Construction of phase 5 and 6: Digital examination and remainder of the course

The layout of the different chapters were all the same (R3). When the student had fully reviewed the content of the e-learning module, the student could start the test. This test was aimed at determining whether the student mastered the content of the e-learning module. The test consisted of questions that were asked in the same manner as in the e-learning module. This ensured that the questions were easy

to understand (DR 16). The questions consisted of multiple choice questions, point and click questions and drag exercises. The questions were asked in a different layout, this layout can be seen in figure 10. The student had to answer 60% of the questions correctly, in order to participate in the practice sessions in which they could practice with the role of game-supervisor (DR 9). In the last chapter the student got more information about the remainder of the course.

Figure 10. Example question

Implementation and formative evaluation

The implementation is about testing the prototype of the e-learning module, with end-users providing formative feedback. The prototype will be tested with six different end-users. The implementation of this prototype offered the opportunity to assess whether the e-learning module fits the needs of the end-users. The formative feedback determines which adjustments has to be made in order to optimize the e-learning module.

First, a description will be given of the end-users who tested the prototype. Secondly, the variables and instruments that were used to test the prototype will be described. Thirdly, the procedure how the prototype was tested will be described. The results provide qualitative input to improve the prototype.

Respondents

The prototype has been tested by six different end-users. The end-users were selected from a football club located in Saasveld, a small village in the Netherlands. The end-users were between the age of 14 and 16 and, therefore, match the criteria of minimal age. All end-users were male. The end-users had not yet participated in any of the courses that the KNVB offers their customers and, thus, had no substantive knowledge about the subject. The end-users were picked from two different youth teams of Saasveldia, namely the ‘C youth’ and the ‘B youth’. The reason to test in different teams is to assess if different groups understand the outline of the prototype.

Variables and instruments

Two methods were used to conduct formative evaluation. First, a walkthrough of the prototype with the end-users was conducted. Secondly, a group interview with the end-users was conducted.

The aim of the walkthrough of the prototype was to assess the experiences of the end-users and to obtain points of improvement. In the walkthrough, the end-users had to test the e-learning module on the computer. Every step that they took had to be verbally explained to the researcher. This walkthrough focussed on finding glitches and other possible improvements that had to be made in order to improve the e-learning module.

The aim of the semi-structured group interview was to determine further which improvements had to be made to the prototype. End-users had the opportunity to react on different questions. However, there was also room for discussion about their own experiences and ideas on how to improve the prototype. Questions that were asked during the group interview were: ‘What was the most challenging aspect about the prototype?’, ‘Was the language understandable?’, ‘What would be an suggestion to improve the prototype?’, ‘Did the prototype prepare you for the role of game-supervisor?’, ‘What was

the most important thing that you learned?', 'Was the prototype easy to use?', and 'Where the games in the e-learning module understandable?'.

Procedure

The end-users were asked if they wanted to participate in testing a new course for the KNVB. After their consent, they were asked to go through the prototype. They were instructed to use the e-learning module as if it was a training they participated in voluntarily. The end-users then took place behind a computer. Before starting, the researcher stated that the end-user had to verbally explain what steps they were going to take and why. If the end-users had questions concerning the e-learning module, they could ask the researcher for information. During their encounter with the prototype, the end-users were constantly in contact with the researcher. However, the researcher was only there to help the end-user if necessary. No contact was initiated by the researcher. The entire walkthrough lasted about 30 to 45 minutes. Afterwards, the end-users were interviewed in a group interview about their thoughts on the e-learning module.

Results

The feedback of the end-users are presented in this section. The feedback will be presented per chapter.

In the introductory phase, the end-users stated that the text under the animated video did not add much to this chapter. According to the end-users, the introduction could only consist of the animated video. One of the six end-users did not find the animated video very detailed. According to him, this could really be improved. However, everyone was convinced that the animated video explained the role of the game-supervisor well. Nevertheless, all end-users agreed that the animated video could be played slightly slower. This chapter was easy to understand for each end-user. The user controls for the animated video were not widely used despite the speed of the animated video being fast. One end-user mentioned that, despite the fact that this was the introduction phase, it was not explained how the e-learning module works exactly. But, this did not affect the further continuation of the prototype.

In the second phase of the e-learning module, the opinions of the end-users were different from each other. Four of the six end-users had no problems with the sequencing of the e-learning module. Two of the six end-users, however, indicated that they did not know exactly where to click on. For example, in one screen where the end-users could click on different symbols, there was no literal explanation that the icons could be clicked. After a while, these end-users noticed that they could click on the icons. All the end-users liked the fact that there were multiple games in this phase. The click and drag game was especially appreciated. To illustrate this, one end-user said: "It was nice that there was a small game where we had to drag the right rules to the right icon, that really helped me to learn the rules".

In the third phase, the end-users learned about their role during the match. Most end-users said that this was the most beneficial part of the e-learning module. The end-users liked the fact that a lot of

video material was presented by a professional referee. The voice of the referee was calm and understandable. Furthermore, the end-users liked the assignments containing different scenarios, in which they had to make a choice on how they were going to act. The choices they made, could lead to different outcomes of the scenario. The feedback they got from this scenario helped them to understand their role as game-supervisor. For instance, one end-user said: “I thought I was making the right decision by ignoring the parent who yelled at his child, but in fact the parent kept yelling. The feedback was helpful because it provided alternatives on how to approach the situation”. Since there are only four scenarios, some end-users said it would be helpful if there were more scenario’s in which they had to make decisions.

In the fourth phase, end-users learned about the role of the game-supervisor after the game ended. Some end-users indicated that they already knew that it is usual to shoot penalties after the match. The movie in this phase showed a child that was very disappointed because he didn’t receive the ball during the match. But after he scored a penalty, the boy was very happy. One end-user said that he would like to be able to play a game during this phase, because he really enjoyed playing a game during the other phases.

The last phase was the digital examination students had to make. All end-users stated that the questions in the digital examination were easy to understand. In fact, they agreed that the examination could be a bit more difficult. One end-user said that the instructional movies has helped him to remember a lot of information during the examination. Some end-users noted that the feedback on the questions could be more thorough. They found the feedback very limited.

Conclusion

In this chapter, the implementation and formative evaluation that was conducted within two youth teams at Saasveldia is described. Overall, the end-users were very happy with the prototype. However, there were some recommendations to improve the e-learning module. For example, providing a better instruction on how to use the e-learning module. In the prototype, end-users had to experiment where to click. Other suggestions to improve the e-learning module was to provide more feedback after the questions and to provide more interaction. Some participants mentioned that they really liked the interactive game elements and would, therefore, like to see more of those.

Conclusion

The last chapter contains the conclusion and discussion of this study. This chapter describes the conclusions about the design and development of an e-learning module for the course game-supervisor for the KNVB.

Recommendations for the KNVB

The Demonstration Based Training approach was used in this study, however limited amount of research has been done on this subject. From the experience of this study, the DBT-model was a helpful tool to design instructions. The first recommendation is to further employ more empirical studies in order to gain an understanding which instructional features are effective and in which circumstances they are effective in.

Another important aspect to take in consideration was the suggestions and tips of the participants during the test phase of the prototype. In a group interview the participants made some suggestions to improve the e-learning module. Some of these suggestions can be easily adjusted. For example, adding more detailed feedback after an assignment. Another recommendation was to slow down the animated videos. Providing better instructions about how to use the module was also a suggestion. One suggestion was to improve the feedback after a question. Alvarez, Salas and Garofano (2004) confirm this suggestion. In their research they emphasize the effect feedback has on the learning of an individual. Another suggestion was to add more interaction in the e-learning. Now, there are a few games throughout the e-learning module, but some participants mentioned that they really liked these elements and would therefore like to see more of them. Another suggestion was to add more scenarios to the e-learning module. These suggestions can be used to further improve the e-learning module. However this prototype should be tested in a larger test group to identify further points of improvement. The research group in this study was too small to draw conclusions.

Some participants made the suggestions to make the exam more difficult. According to them, the questions that are asked during the exam could be made more difficult. However, the questions are meant to give an indication if someone understand the rules, role and position of the game-supervisor. Since that was the case for every participant in the current research group, it seems that the questions are sufficiently difficult. However, it may be recommended to test these exam questions in a larger research group to see if the results will be the same.

Another recommendation was to test the e-learning module with experts in the field. In this study, the participants were selected because they were a match with the description of the target group. However, it is recommended to discuss the e-learning module with other educational developers or referees as well. It is likely that these experts can give a useful contribution to the further development of the e-learning module.

At last, it is recommended to identify the learning effect of the e-learning module. This is a qualitative study. The design of the e-learning module is the focus of this study. However, to test if the e-learning module actually learns students new information, the learning effects should be studied in further research.

Discussion

The first point of discussion are the focus groups that were performed during this research. The focus groups in this research gave a lot of information about how the prototype should look like and what information should be presented in the prototype. However, one-on-one interviews with representatives of the KNVB and possible end-users could lead to different ideas because the interviewee might be more comfortable to give his or her opinion. During the focus groups, not everyone's opinion became clear since some participants did not feel the need to share their opinion in a group. Therefore, group interviews might not be the best solution to find out the needs and opinions of the targeted audience.

Another point of discussion is the test phase of the prototype. It was decided to test the prototype with possible end-users of the e-learning module. The participants of the test phase had to use the prototype and explain every step that they took. This really helped in figuring out what participants were thinking and what was still unclear about the prototype. The group of end-users consisted of six participants. Since this is such a small number, it is difficult to know for sure whether all areas for improvement became visible. Perhaps there would have been more insights for improvement if a larger test group had been used.

The prototype was created based on the ADDIE-model. This means that the prototype used a systematic design approach. However, literature also provides other methods to develop an e-learning module. The first alternative is the Dick and Cary model (Dick & Cary, 1990). This model provides a more detailed look on the design process. Another instructional design model is ARCS (Keller & Suzaki, 1988). This model is an effective model to motivate learning among students. Therefore, it is also referred to as the motivational design method. A more practical design method is PIE (Newby et al., 2000), which is a model with a simpler design and, therefore, easier to use. PIE stands for plan, evaluate and implement. This model is helpful in focusing on what is really necessary when time is limited. There are enough alternatives to design an e-learning module. However, in this research the ADDIE-model was chosen because this model provides a better systematic design approach that fits this study the best. The five different phases of the ADDIE-model helped to structure the process of developing an e-learning module.

Furthermore, the DBT-model was used in this study. The DBT-model really helps to develop demonstration-based learning material because it connects the instructional features with learning processes and their learning outcomes. In addition, the DBT-model is user-friendly and easy to adjust. Therefore, the model is very useful for designing an e-learning module where video learning plays an important role. This is in contrast to other models such as the "Felder design model", in which several

Felder recommendations have been merged into a model (Schneider et al., 2006). The Felder design model does not provide the desired structure as the DBT-model does. Furthermore, other models provide more guidelines for the process to develop a training instead of a clear structure to develop specific demonstration-based learning material.

At last, designing the prototype was the sole purpose of this study. In this stage of the development of the e-learning module, it is impossible to determine the exact learning effects of the prototype. Therefore, this study does not provide results on the learning effect of the prototype and the motivation of students to use the prototype. However, the implementation showed that the end-users who tested the prototype, experienced the prototype as a fun and alternative way of learning. This prototype e-learning module has provided a solid basis on which the final e-learning module for game-supervisors can be designed in the near future.

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Appendix A

Attendees at the focus group ‘representatives of the KNVB’:

- Nicky Siebert: head training development
- Werner ter Avest: coordinator referee training
- Sebastiaan Kleijburg: coordinator referees and competitions
- Jurjen Niehuis: employee organization club referees
- Stefan Hoekstra: employee organization club referees
- Nicole Jacet: employee referee training
- Rob Langenberg: referee

Appendix B

Vanaf seizoen 2017/'18 – O.8 en O.9
Vanaf seizoen 2018/'19 – O.10

Wedstrijdvorm
6 tegen 6

Aantal spelers 6 tegen 6	**Leeftijd** Onder 8, 9 en 10	**Veldafmeting** 42,5m x 30m	**Doelformaat** Pupillendoel (5m x 2m)
Balformaat Advies maat 4, 290 gram	**Spelduur** O.8/O.9: 2 x 20 minuten O.10: 2 x 25 minuten	**Keeper** Ja	**Competitie** Ja
Klassement Nee	**Rituelen** Handen schudden en high five	**Rol coach** Positief stimulerend langs zijlijn	**Rol ouders** Positief stimulerend langs zijlijn
Rol arbitrage Spelbegeleider bewaakt de voortgang van het spel			**Strafschop** 7 meter

Spelregels

Aftrap: de aftrap wordt genomen in het midden van het veld. Beide teams starten vanaf de eigen helft.

Keeperbal: wanneer de keeper een bal vangt die niet is uitgegaan mag de keeper het spel voortzetten door de bal te gooien, passen of uit de handen te schieten.

Achterbal: de achterbal wordt vanaf de grond genomen door de bal te passen of te schieten.

Hoekschop: hoekschoppen worden vanaf de hoekpunten vanaf het speelveld genomen door de bal in te dribbelen of te passen.

Doelpunt: bij een doelpunt vindt de aftrap plaats in het midden van het veld. Beide teams beginnen weer vanaf eigen helft.

Uitbal: als de bal over de zijlijn gaat, wordt de bal ingedribbeld.

Vrije bal: een vrije bal mag ingedribbeld, gepasst of geschoten worden.

Terugspeelbal: een terugspeelbal mag door de keeper niet opgepakt worden.

Overtreding / scoringkans: bij een overtreding wordt een vrije bal door de tegenpartij genomen. Bij het ontnemen van een duidelijke scoringskans zal er een strafschop worden toegekend.

Afstand: de tegenstander staat minimaal op 5 meter afstand bij elke spelhervatting.

Speeltijd
De speeltijd voor onder 8 en onder 9 is 2 x 20 minuten. Voor onder 10 is dat 2 x 25 minuten.

Time-out
Per helft vindt er bij O.8/O.9 na 10 minuten en bij O.10 na 12,5 minuten een time-out plaats van maximaal 2 minuten. Hierin heeft de begeleider de mogelijkheid om een korte terugblik te doen, tips en aandachtspunten aan te stippen en kunnen de kinderen even wat drinken.

Rust
Na de eerste helft vindt de rust plaats van maximaal 10 minuten.

Competitie
Er wordt wel een competitie (poule-indeling en wedstrijdschema) georganiseerd voor deze wedstrijdvorm.

Stand & Klassement
De KNVB zal geen standen of klassementen tonen. Wel worden de uitslagen van wedstrijden bijgehouden om de speelsterkte per team te bepalen en op basis daarvan eventueel teams te herindelen.

Begeleiding
Bij deze wedstrijdvorm is er een spelbegeleider van minimaal 12 jaar oud in sportkleding aanwezig. De spelbegeleider staat niet in maar langs het veld en neemt bij het onjuist toepassen van de spelregels een beslissing en legt de spelregels uit. Als het nodig is mag de spelbegeleider wel het veld in bewegen.

Balmaat
De KNVB adviseert om met een balmaat 4, van 290 gram, te spelen.

Rituelen
Stimuleren om voorafgaand aan de wedstrijd handen te schudden en na afloop een high five als dank voor een leuke wedstrijd.

Strafschop (7 meter)
Strafschoppen worden alleen gegeven bij het ontnemen van een duidelijke scoringskans. Na afloop van de wedstrijd kunnen er door beide teams strafschoppen worden genomen.

Ontwerp: Link Design Amsterdam