Designing an online training to enhance attitude towards handling scientific press releases

Tessa Voerman

October 2017
Psychology – Learning Sciences

1st supervisor: H. van der Meij, University of Twente
2nd supervisor: H. Leemkuil, University of Twente

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Abstract

This educational design study examines how the attitude of journalists towards handling scientific press releases, distinguished in ‘receiving’, ‘scanning’ and ‘thoroughly reading’ scientific press releases, can be enhanced through online training. For this, need, context, learner, learner task, content and literature analyses combined with formative evaluation have led to the development of a custom-made online training. Key in this study is ‘attitude’ as a component of the Theory of Planned Behavior (Ajzen, 1991). A questionnaire was developed to evaluate the effectiveness of the training on attitude towards handling scientific press releases. Significant differences were found on items regarding ‘scanning scientific press releases’ and on ‘affective appraisal of scientific press releases’. However, no other significant differences were found, raising questions about the sample size, the training design and the fit between the questionnaires, the training content, the training design and attitude.

1. Introduction

Scientific research is gaining popularity within the Dutch population. Increased media attention to scientific research, via television, festivals and magazines has boosted wide interest. Nevertheless, the Dutch population still gets its updates and information regarding scientific research through news broadcasting organizations reporting on scientific research and developments (Korthagen, 2016). This is commonly referred to as science journalism.

When operating as science journalists, news journalists usually get into contact with scientific research through press releases. These scientific press releases are mostly received by e-mail from academic journals, institutions or scientists personally, hoping to get a news item on their research. Upon receiving a scientific press release, the journalists assess whether it is worth scanning, based on the title or heading. After scanning, they decide whether the scientific press release is worth reading thoroughly and next they must decide whether to move on to the construction of a news item.

This process from press release to eventual news item has been criticized, as news organizations receive critique on news items regarding scientific research. The critique stems from scientists and from readers and viewers of the news broadcasting organization (hereinafter: the public) alike. The critique concerns the following aspects: 1) reporting inaccurately, incompletely and uncritically (Fjæstad, 2007; Hijmans, Pleijter & Wester, 2003; Dunwoody, 2014), 2) using language that is too simple and popular (Radford, 2007; Allan, 2011; Hijmans et al., 2003), 3) unbalancing their choices on what topics and outcomes to report and not report (Fjæstad, 2007; Hijmans et al., 2003), 4) lack of scientific research literacy of journalists (Young & Solomon, 2009; Allan, 2011), 5) commercialism of news organizations (Fjæstad, 2007; Radford, 2007; Allan, 2011; Korthagen, 2016) and 6) commercialism of scientists (Fjæstad, 2007; Korthagen, 2016; Granado, 2011; Palmerini, 2007).

The critique should be taken seriously, as science journalism is the main influence for the way the public judges scientific research (Korthagen, 2016). For example, in 2015, research on the correlation between cancer and eating red meat was interpreted wrongfully by several Dutch media organizations, including news broadcasting organizations. This caused quite a stir in economics and health care as society en masse stopped buying and eating red meat, afraid of cancer risks.

With the critique in mind, journalists should learn to critically appraise scientific research and associated press releases (Young & Solomon, 2009; Korthagen, 2016; Hijmans et al., 2003). However, this thesis cannot fully address all facets of this learning need. As an initial effort, this thesis research focuses on the foundation of learning to critically appraise scientific press releases, namely the attitude of the journalists. Generally, this attitude concerns the valence of the three consecutive behaviors of the overarching construct ‘handling press releases’, namely a) receiving, b) scanning and c) thoroughly reading press releases. The idea is that support for the

development of the journalists' attitude towards handling press releases provides an important first step in improving the journalists' behavior of reporting on scientific research.

1.2 Theory of Planned Behavior

A major theory on behavioral change is the Theory of Planned Behavior (e.g. Ajzen & Fishbein, 2005; Ajzen, 1991). This theory describes why a person choses to perform a specific behavior or not.

Behavior can be defined as "*the overt actions of an individual*" (Albarracín, Johnson, Zanna & Kumkale, 2005, p.6). Behavior does not occur spontaneously, but is influenced by a person's intention to perform that behavior (see Figure 1).

The strength of this intention is determined by the perceived probability that the person will perform the behavior (Ajzen, 1991; Liaw, Huang & Chen, 2007). The stronger the intention, the more likely it is that the behavior will be performed (Ajzen, 1991). So, to maximize the chance of behavior to occur, intention should be as high as possible. In the current study, journalists' intention to receive, scan and read scientific press releases thoroughly should be as high as possible.

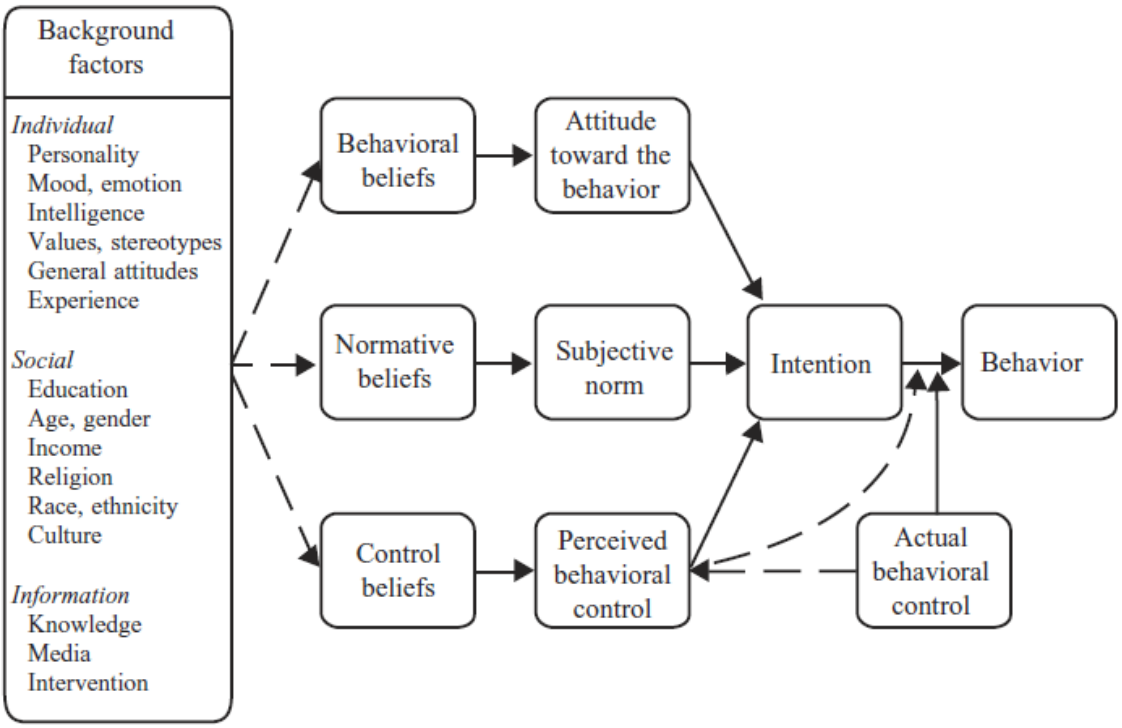

Figure 1. Theory of planned behavior (Ajzen & Fishbein, 2005).

Intention is determined by an attitude towards the behavior, a subjective norm and a perceived behavioral control (see Figure 1). This thesis concentrates on only the first aspect of the model, namely the attitude towards behavior. This can be defined as "*the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question*" (Ajzen, 1991, pp. 188). Appraisal can be divided into two components that express attitude: cognition and affect (Ajzen, 1991; Ajzen & Fishbein, 2005; Crites, Fabrigar & Petty, 1994).

Cognitive appraisals of behavior concern a person's perceptions of the likability, (dis)advantages, consequences, importance and relevance of performing a behavior. These appraisals are based on attributes and behavioral traits (Crites et al., 1994). For example, when the positive consequences outweigh the perceived negative consequences, it is more likely that a favourable attitude towards the behavior is formed (Ajzen & Fishbein, 2005).

Affect appraisals concern a person's emotions towards the behavior, varying from pleasurable to unpleasurable (Breckler, 1984; Ajzen & Fishbein, 2005). The more positive emotions towards a behavior are, the more likely that behavior will be performed (Ajzen & Fishbein, 2005).

1.3 Measurement of attitude

In this study, a measurement instrument for attitude is developed, to measure attitude towards handling scientific press releases. This overarching construct can be distinguished into 'receiving', 'scanning' and 'thoroughly reading' scientific press releases, in relation to cognitive and affective appraisal. The instrument employed a questionnaire that operationalized the theoretical construct attitude into measurable components (see Appendix A).

The questionnaire comprised three segments, corresponding to the three behaviors. Each behavior segment started with an item regarding frequency, for example: *How often have you scanned scientific press releases in the past three months?* Frequency was indicated on a 5-point scale from 1 (*never*) to 5 (*every day*). The attitudes of respondents who indicated that they did not perform one or more of the behaviors in the last three months were discarded from the sample. Twelve items regarding cognitive and affective appraisal followed.

Cognitive appraisal of the three behaviors was measured by asking a person about the difficulty and importance of the behavior. For example, the attitude towards 'scanning' was measured with an item like: *I think scanning scientific press releases is important.* Notice that the word 'think' in this item points to cognition.

Affect was measured by asking a person about the positive and negative emotions he or she feels towards a behavior. An illustrative affect item for 'scanning' was: *I experience scanning scientific press releases as fun*. Notice that the word 'experience' in this item points to affect.

1.4 Context

Specifics about the content can be requested via the researcher.

1.5 Methodology

The study is an educational design research, as it tries to gain insight in design characteristics of online training for attitude enhancement from both a practical and a theoretical perspective. Educational design research focuses on designing a product or intervention to solve an educational problem, while contributing to the body of knowledge on the characteristics and effectiveness of the designed product

or intervention (McKenney and Reeves, 2014).

The design process follows the three phases of McKenney and Reeves (2014): 1) analysis and exploration, 2) design and construction and 3) evaluation (see Figure 2).

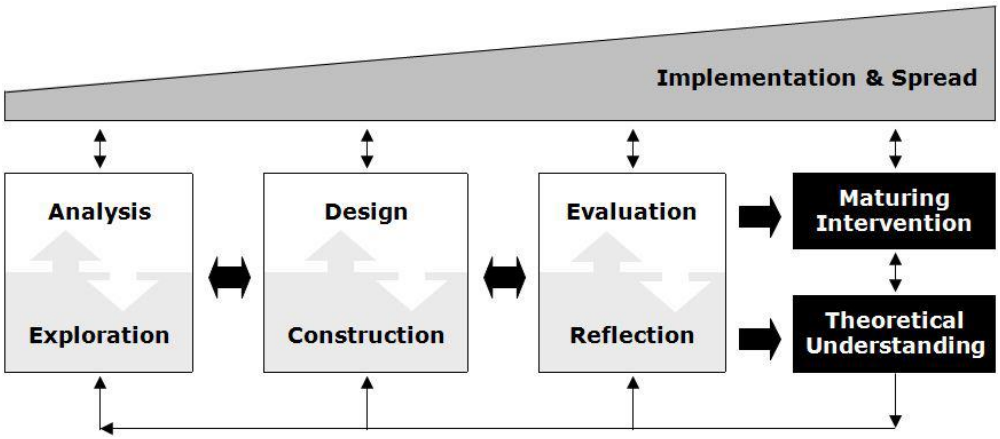

Figure 2. The generic model for executing educational design research (McKenney & Reeves, 2014).

The model is systematic and iterative, allowing improvements on the process and design, based on continuous reflection.

1.6 Research Questions

The study aims to design an online training to enhance journalists' attitude towards handling scientific press releases as an overarching construct and 'receiving', 'scanning' and 'thoroughly reading' scientific press releases as its inferior constructs. This leads to the following research question:

What should an online training design look like in order to enhance journalists' attitude towards handling scientific press releases?

For instance, the online training tries to make the journalists excited and curious the next time they open their mailboxes and see scientific press releases have come in. Also, the online training should stimulate journalists to scan more scientific press releases more often so as to not neglect interesting press releases. Furthermore, the online training tries to have journalists read press releases more closely and spend more minutes of their time on them, to avoid making mistakes. Whether the training actually achieves this attitude enhancement is researched by the following research question:

What is the effectiveness of the designed online training on the journalists' attitude towards handling scientific press releases?

Once having gained insight into the 'success' of the training, it is useful to know about the user experience of the online training. This leads to the following research question:

What is the usability of the designed online training on the journalists' attitude towards handling scientific press releases?

For instance, when the online training is unnecessarily complex or inconsistent, it is unlikely that the training will be used by the target audience. A high usability score, and thus a positive user experience from the target audience, increases implementation chances.

2. Design research

2.1 Process

The ‘analysis and exploration’ phase started with an extensive literature study to provide the foundation for general design decisions of the training.

Need, context, learner and learning task and content analyses (NCLL-analyses) were performed, based on McKenney and Reeves (2014). During these analyses, interviews were held with the Academy, two subject matter experts within the organization and five journalists of the organization.

The findings derived from this phase formed the basis for the construction of a training script and storyboard, that in the phase of ‘designing and constructing’ was tested in iterative rounds of design and formative evaluation.

2.2 Need, context, learner and learning task analyses

The NCLL-analyses provided design guidelines for the organizational environment, characteristics, wishes and needs (Smith & Ragan, 2005), ensuring a fit between the training and the context in which it must be integrated. The fit increases the chances of successful implementation (Smith & Ragan, 2005; Alomyan, 2004).

Implementation chances were also increased by generating ownership and commitment from involving members of the target audience in the design process (Nieveen & Folmer, 2013; van den Akker, 1999). That is, five journalists were recruited as participants. These journalists varied in age, job-department and years of working experience (with a minimum of one year).

The job environment of the journalists worked in was fast, dynamic and full of surprises, as news goes on 24/7. The journalists themselves were eager to learn, ambitious and critical, as they held high expectations for themselves and colleagues. The journalists varied in prior knowledge on scientific research, but shared a similar background in journalism. They were highly educated and had well-developed cognitive processing strategies for learning. Although they were familiar with modern technology and interested in new technologies, none of them had ever engaged in e-learning. This prompted them to indicate that training design should be approachable and highly structured for support.

2.3 Content analysis

The content analysis articulates the information the learners should learn to achieve the training goals. The general goal of the training is to enhance the journalists’ attitude towards handling scientific press releases. Forthcoming learning objectives are listed in paragraph 2.4 *Summary of guidelines and objectives abstracted from the analysis phase*. These objectives are based on the Taxonomy of Educational Objectives of Krathwohl (2002), which provides an organizational structure for the online training.

The general training goal should be achieved by providing new and persuasive information to the learner on consequences and positive emotions regarding handling scientific press releases (Ajzen & Fishbein, 2005; Simonson & Maushak, 1996). According to Ajzen & Fishbein (2005) should positive emotions outweigh negative emotions to be able to enhance attitude. In the same vein, in the current study, it is assumed that appealing to a person's negative emotions can change a person's attitude as well. For example, by presenting persuasive information that evokes fear or guilt, a person can change its attitude to deal with these negative emotions. An illustrative example is the following narrative, used in the online training: "*… when you deliver the news* (on developments in cancer research on mice) *as if it is a valuable breakthrough for humans, cancer patients and their families can become very hopeful, while this hope is premature*."

For the training content, conceptual graph analysis is used to "*represent the structure of an expert's thinking*" (Jonassen, Tessmer & Hannum, 1999, p.201). This approach aims to identify, structure and sequence content by eliciting expert knowledge through interview methods (Jonassen et al., 1999).

Three main content topics resulted from this analysis: science journalists' functions, responsibilities and impact.

Functions. News journalists in the Netherlands operate in three ways: 1) as an information provider about new findings in scientific research, 2) as a medium for experts to comment on public societal debates and 3) as a watchdog to notify the public about malfunctioning scientific research (Korthagen, 2016).

Responsibilities. Various scholars state that there is a correlation between a person's attitude and his or her acceptance of responsibilities. For example, Ajzen and Fishbein (2005) link responsibility to the perceived consequences of performing a behavior and therefore to a person's attitude. When someone is highly accepting of the responsibilities, the likelihood of contributing in the behavior to achieve the perceived positive consequences increases (Kok & Siero, 1985). For this, a person needs to be (made) aware of the potential consequences of performing the behavior (van Liere & Dunlap, in Kok & Siero, 1985).

Impact. The journalists' news items have a massive impact on the way the public views scientific research, as they are the main source of the public's scientific research information. In addition, the news items can have positive or negative consequences for the view those journalists and the entire news organization (Korthagen, 2016).

2.4 Summary of guidelines and learning objectives abstracted from the analysis phase

Guidelines:

1. *The training should be available online*.
2. *The training should be kept private within the organization.*
3. *The training should have a fast pace and last 1 hour maximum.*
4. *The training should relate to real-life job tasks.*
5. *The training should be approachable and highly structured*.

6. *The training should present information on the positive consequences of handling scientific press releases.*
7. *The training should present information on the negative consequences of not handling scientific press releases.*
8. *The training should present information on both positive and negative emotions regarding handling scientific press releases.*

Learning objectives:

1. *Learners can recall the three functions of science journalists.*
2. *Learners can recognize the responsibilities science journalists have.*
3. *Learners can recognize the impact of science journalists on the public on one hand and scientists on the other hand.*

3. Training design

Online training, or e-learning, is a popular form of instruction. A main characteristic and advantage of e-learning is the freedom to participate at any time and place. Another advantage is that learners have unlimited access to information, that can be updated at any time (Zhang, Zou, Briggs & Nunamaker, 2005). In addition, e-learning allows for self-directed learning (Alomyan, 2004; Zhang et al., 2005) and lends itself well to multimedia instructions, especially video.

Videos are used in the training, because they present concise information in an attractive way (Zhang et al., 2005; Ertelt, 2007) and can enhance learning (van der Meij & van der Meij, 2016; Ertelt, 2007). Furthermore, videos are relatively easy to create (Plaisant & Schneiderman, 2005).

The training design consists of an introduction video, three content videos, corresponding to the three topics, and a review video, which aimed to anchor the information from the content videos. The average length of the videos was 1 minute and 22 seconds (0:37 – 1:57), short enough to keep the learner attentive. The pace, the speed of the presentation of the information to the learner, is relatively high to fit the characteristics of the target audience. This prevents cognitive overload from a too fast presentation and prevents boredom from a too slow presentation (Brar & van der Meij, 2016).

To enhance learning, the videos in this study are further based upon the principles of Clark and Mayer (2016) on multimedia (not to be confused with 'the multimedia principle', which is a fraction of the overview of principles). Clark and Mayer (2016) distinguish between three design goals that contain several design principles that can influence the learners' processing. The first goal, minimizing extraneous processing, refers to keeping the cognitive load low. For instance, it is important to make the training interface easy to understand (van der Meij & Carroll, 1995). The second goal, managing essential processing, refers to finding the proper balance between presenting the complexity of the content in relation to the learner's capacity. The third and final goal, fostering generative processing, refers to developing a deep understanding of the content. For this, the learner needs to be motivated "*to make sense of the material*" (Clark & Mayer, 2016, p.37), which

demands training design to promote this engagement. (for an overview of the theory by Clark and Mayer, see Table 1)

Table 1

Design principles for …

Goal	Multimedia principle
Minimizing extraneous processing	Coherence principle: Do not use unneeded words, sounds or graphics. Contiguity principle: Place printed words near corresponding part of graphic. Redundancy principle: Use graphics and audio rather than graphics, audio and on-screen text. Worked example principle: Provide step-by-step demonstrations.
Managing essential processing	Segmenting principle: Break a continuous lesson into manageable parts. Pretraining principle: Provide pretraining in the names and characteristics of key components. Modality principle: Use audio rather than on-screen text.
Fostering generative processing	Personalization principle: Use conversational style rather than formal style. Multimedia principle: Present words and graphics rather than words alone. Engagement principle: Ask learners to elaborate on the material.

Note. Distilled from Clark and Mayer (2016, p.39).

The ten principles are used as a checklist for the design of the training in general, and the videos in particular so that learning and motivation are enhanced, as will be described later.

Another directive for the design of the training and videos consists of the Expanded Events of Instruction (Smith & Ragan, 2005). According to this directive a standard instructional lesson consists of three consecutive phases or components: introduction, body (of content knowledge) and conclusion. These events are integrated into the instructional videos of the online training. For example, in the video on the three functions of scientific journalists, the following structure is displayed:

Introduction. The first sentence in the narrative on the topic 'functions' is: "*Before we look at … let's look at the functions you can have as a science journalist*". This introduction explains the goal and purpose of the video. In addition, it gives an overview of what the journalists can expect, operating as an advanced organizer that can stimulate prior knowledge activation and enhance the probability of learning (Smith & Ragan, 2005; Clark & Mayer, 2016). Note that in the narrative, the learner is addressed as 'you', which diminishes the perceived distance between learner and narrator, according to the personalization principle (Clark & Mayer, 2016; Brar & van der Meij, 2016).

Body. This section explains the three functions via simple and playful narrated animations (see Figure 3). The simplicity of the animation is in line with the coherence principle (Clark & Mayer, 2016). Furthermore, almost no on-screen words are used, conforming to the redundancy principle (Clark & Mayer, 2016). The animations visually support for the narrative (Mayer & Moreno, 2003). They can enhance the learners' mood and emotions and therefore raise motivation. Motivation is essential for learning and for behavior performance. The more motivated a person is to perform a behavior, the more likely that behavior will happen (Bandura, 1986; van der Meij & van der Meij, 2014). Motivation can also be enhanced by increasing the learners' self-efficacy, which is the belief of a person in his or her capabilities in performing a behavior (Bandura, 1986). In the video on functions, self-efficacy is stimulated by making the learner aware of the value of operating according to the functions, e.g. "*you are a watchdog, who can denounce fraud in science to the wide public*".

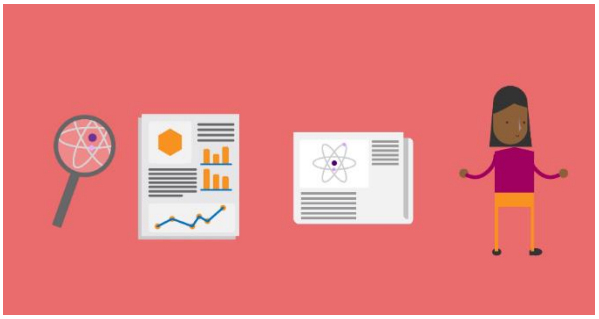

Figure 3. Screenshot training

While the content is presented, the learners' attention is continuously directed to relevant information, for example by presenting exclamation points to emphasize relevance (see Figure 4). This technique is called signalling (van der Meij & van der Meij, 2016; Plaisant & Schneidermann, 2005), which is an instructional feature that effectively guides attention to relevant information without adding extraneous content (Brar & van der Meij, 2016; Rosen, Salas, Pavlas, Jensen & Lampton, 2010; Grossman, Salas, Pavlas & Rosen, 2013). Attention is important in this training because it demands the learners to "*actively process what they are observing to learn*" (Rosen et al., 2010, p.598). Signalling reduces cognitive load and facilitates learning (Chandler & Sweller, 1992; Richter, Scheiter & Eitel, 2015).

Figure 4. Screenshot training

As seen in Figure 4, the videos make use of a toolbar, where learners can rewind or skip parts of the video. This enables learner control (Brar & van der Meij, 2016). Learner control allows learners to manage their learning by affordances for choosing the learning paths and – to some degree – set their own learning pace (Zhang et al., 2005; Alomyan, 2004). Presenting information via multimedia enhances learning more

when the information is divided into learner-controlled segments rather than as an uninterrupted whole (Mayer & Moreno, 2003; Brar & van der Meij, 2016). Furthermore, user control creates a sense of autonomy, which increases motivation (Ertelt, 2007).

In addition, the videos are segmented. For instance, an introductory slide precedes each slide that one of the functions of journalists (see Figure 5). In segmentation, the content is split into meaningful and manageable units (Clark & Mayer, 2016).

Figure 5. Screenshot training

After watching the video, the learner must answer one or more questions. The quizzing should help the learner decide if he or she needs to re-examine the content (see Figure 6). Quizzing also actively engages the learner with the content; quizzing stimulates the learner to become a more active participant (Smith & Ragan, 2005). Upon answering the questions, learners immediately receive feedback indicated by a red bar and an incorrect mark or a green bar and a correct mark (both shown in Figure). Feedback is critical (Smith & Ragan, 2005) as it supports learning and can increase motivation (Ertelt, 2007).

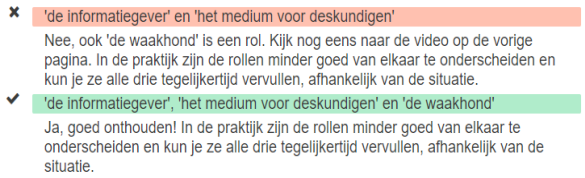

Figure 6. Screenshot training

Conclusion. A one-sentence review summarizes the main point of the video. The review is signalled by a change in background colour and the vocalization and visualization of the word ‘remember’ (see Figure 7). This way, cognitive support for rehearsing the content is provided, which enhances learning (van der Meij & van der Meij, 2015; Brar & van der Meij, 2016) and future application of the learned content (Smith & Ragan, 2005).

Figure 7. Screenshot training

3.1 Formative evaluation

To gain insight into the target audience's experience with the prototype, small-scale formative evaluations were held (Nieveen & Folmer, 2013; Smith & Ragan, 2005). In the present study, three of the five consulted journalists participated in one-on-one sessions of formative evaluation. The other two consulted journalists were not available due to practicality. The three journalists differed considerably in gender, age, experience, job position and scientific background. The formative tests were executed by the designer (see Appendix C), which led to a more direct and stronger impact on the designer's thinking and actions (Nieveen & Folmer, 2013). Observations recorded how respondents used the training. In addition, the plus-minus method (Lentz & de Jong, 1997) was employed to obtain suggestions for improvement, which were integrated in the creation of the final online training. An illustrative example of these suggestions was the need for more supportive navigation, as the journalists felt 'lost' as to what to do when a video ended. Another suggestion was that the feedback text at formative assessment questions needed to be more concise, as it was often skipped by the journalists due to disinterest. However, in general, the journalists acknowledged the fit between the training and the target audience. More precisely, they indicated to enjoy the animations in the videos and the short duration of the training.

4. Effectiveness measurement - Method

4.1 Respondents

Forty-five news journalists of the organization (26 males and 19 females) completed the first questionnaire (see Table 2). The respondents were recruited by inviting all 450 news journalists of the organization via e-mail. An incentive, a coupon, was raffled among the respondents. 24 respondents did not participate in the second questionnaire. Therefore, the data analysis concentrated on the 21 participants who completed both the first measurement and the repeated measurement.

Table 2

Demographics in years [a]

	Age						
	18-30	31-40	41-50	51-60	61-70	71+	Total
Percent	33.3	19.0	28.6	19.0	-	-	100

	Work experience						
	0-3	4-7	8-11	12-15	16-19	20+	Total
Percent	33.3	14.3	23.8	-	9.5	19.0	100

	Scientific background							
	0	1	2	3	4	5	6+	Total
Percent	33.3	-	4.8	4.8	19.0	19.0	19.0	100

[a] *N* = 21, the respondents who completed both the pre- and post-training.

In the questionnaire, segments measuring attitude towards a specific behavior were preceded by frequency items. When respondents indicated to have ‘never’ performed a behavior, their scores on that behavior were filtered out from further analysis of that behavior. Therefore, these scores were not taken into the analyses of cognitive appraisal, affective appraisal and the total SJAQ, even if those respondents did perform one or more other behaviors. This filtering on a case-by-case basis explains the differences in *N* throughout this section.

4.2 Instruments

For the present study, a dedicated attitude questionnaire was developed, the Science Journalism Attitude Questionnaire. The SJAQ measures the journalists’ attitude towards handling scientific press releases and, more specifically, towards the three behaviors of ‘receiving’, ‘scanning’ and ‘thoroughly reading’ scientific press releases (see appendix A). In addition, the items were spread for cognitive and affective appraisals. The questionnaire also included demographic questions on age, working experience and scientific background. The questionnaire contained 15

closed-question items, organized in three parts. Four items focused on 'receiving' (e.g. "*I experience receiving scientific press releases as fun*"), preceded by a frequency question ("*How often have you received scientific press releases in the past three months*?"), four on 'scanning' (e.g. "*I think scanning scientific press releases is tough*"), preceded by a frequency question and four on 'thoroughly reading' scientific press releases (e.g. "*I experience thoroughly reading scientific press releases as making me insecure of myself*"), again preceded by a frequency question. Six items measured the participants' cognitive appraisals (e.g. "*I think scanning scientific press releases is important*") and six items revolved around their affective appraisals (e.g. "*I experience thoroughly reading scientific press releases as fun*").

All items were presented as statements that needed to be answered using a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*), providing insight into the level of agreement with the statement. The items were alternatingly formulated negative or positive to deal with respondents' inclination to agree with statements (Krosnick, Judd & Wittenbrink, 2005). The positive and negative items were presented alternately. In data analysis, scores for negatively formulated items were reversed.

The System Usability Scale (SUS) included ten items on usability of the training. Illustrative items from SUS are "*I thought the training was easy to use*" and "*I would imagine that most people would learn to use this system very quickly*". The items were answered on a scale ranging from 1 (*completely disagree*) to 5 (*complete agree*). The questionnaire is validated and widely used (Bangor, Kortum & Miller, 2008). For this study, it was translated to Dutch (see Appendix B).

4.3 Procedure

Respondents started by completing the SJAQ. A week or more later, they took part in the training, after which they filled out the SJAQ again. At this time, they also completed the SUS. All respondent action took place via internet, whenever and wherever best suited the individual respondents.

4.4 Data analysis

To answer the research question mean scores from the SJAQ post-training on 'attitude towards handling scientific press releases were compared to the mean scores from the pre-training using a Paired Samples t-test with a 95% confidence interval. This test was also used to compare the mean scores of 'receiving', 'scanning', 'thoroughly reading' and 'cognitive' and 'affective'.

A reliability analysis was executed on those respondents who performed all three behaviors at least once in the past three months, which led to α = 0.834 (*N* = 30). The same was done for the post-training attitude questionnaire; α = 0.883 (*N* = 16), which indicates that SJAQ's internal consistency was very high (see Table 3). Calculated Cronbach's alphas for 'receiving', 'scanning' and 'thoroughly reading' and for all cognitive and affective items show the questionnaires to be moderate to

excellent internal consistent (see Table 3), which indicates efficacy (Crites et al., 1994), with exception of the alpha on 'receiving' pre-training.

Table 3

Reliability scores

	SJAQ		Receiving		Scanning		Thoroughly reading		Cognitive		Affective	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
α	0.83	0.88	0.53	0.63	0.59	0.75	0.60	0.78	0.65	0.73	0.80	0.81
N	30	16	40	16	37	19	34	18	30	16	30	16

Mean scores were calculated per SUS-item to determine the perceived usability of the training, using a 5-point Likert scale. A reliability analysis shows the Cronbach's alpha for the SUS to be 0.66 (*N* = 21), which is satisfactory.

5. Results

5.1 SJAQ: general

The means of the post-training scores (*M* = 3.76, *SD* = 0.60, *N* = 11) and pre-training scores (*M* = 3.54, *SD* = 0.53, *N* = 11) on the overarching construct 'attitude towards handling scientific press releases' demonstrate an increase in attitude. However, a paired samples t-test did not show statistical significance; *t*(10) = 2.06, *p* = 0.06.

5.2 SJAQ: individual behaviors

When looking at the three specific behaviors that were targeted in the attitude questionnaire, 'receiving', 'scanning' and 'thoroughly reading' scientific press releases, the means of the post-training were higher than the means of the pre-training, as shown in Table 4. The difference in 'receiving' mean was 0.14 (*N* = 14). No statistical significance was found; *t*(13) = 1.19, *p* = 0.25. The 'scanning' means differed by 0.32 (*N* = 17), which shows statistical significance; *t*(16) = 3.23, *p* = 0.005. The 'thoroughly reading' means differed by 0.25 (*N* = 15), which is not statistically significant; *t*(14) = 1.66, *p* = 0.11.

Table 4

Attitude[a] means per Behavior

Behavior	Pre-training		Post-training	
	M	(SD)	M	(SD)
Receiving (*N* = 14)	3.95	(0.67)	4.09	(0.64)
Scanning (*N* = 17)	3.28	(0.68)	3.60	(0.53)
Thoroughly reading (*N* = 15)	3.43	(0.66)	3.68	(0.78)
Total (N = 16)	*3.53*	*(0.59)*	*3.74*	*(0.62)*

[a] Scale minimum is 1, scale maximum is 5, respectively the lowest and the highest level of appreciation.

5.3 SJAQ: cognitive and affective appraisal

When distinguishing the attitude scores in the post- and pre-training in cognitive and affective, the means of both aspects have increased (see Table 5). The 'cognitive' means differed by 0.06 (*N* = 11), which did not differ statistically significant; *t*(10) = 0.49, *p* = 0.62. The 'affective' means differed by 0.41 (*N* = 11). This shows statistical significance; *t*(10) = 3.43, *p* = 0.006.

Table 5

Attitude [a] means per Cognitive and Affective Appraisal

Appraisal	Pre-training		Post-training	
	M	(SD)	M	(SD)
Cognitive (*N* = 11)	3.83	(0.53)	3.89	(0.62)
Affective (*N* = 11)	3.26	(0.58)	3.63	(0.65)
Total (N = 16)	*3.53*	*(0.59)*	*3.74*	*(0.62)*

[a] Scale minimum is 1, scale maximum is 5, respectively the lowest and the highest level of appreciation.

5.4 SUS

The mean score on the SUS was 4.12 (*SD* = 0.37, *N* = 21). Noticeable is a near perfect mean score (4.95, *SD* = 0.21) on the (during analysis reversed) item "*I think that I would need the support of a technical person to be able to use this training*".

6 Discussion

The current study explored how an online training could enhance journalists' attitude towards 'receiving', 'scanning' and 'thoroughly reading' scientific press releases. The main design aims were the development of the training and an attitude questionnaire for measuring the effectiveness of the training.

6.1 Research Question 1: What should an online training design look like in order to enhance journalists' attitude towards handling scientific press releases?

Essential in designing online training focusing on attitude enhancement is designing systematically. Keeping close to an educational design research model (e.g. McKenney & Reeves, 2014; Smith & Ragan, 2005) has led to preliminary analyses that showed in-depth and particularized insight into the situation in which design was integrated. For example, a thorough problem task analysis yielded useful, detailed guidelines that helped ensure that the training design included the proper the training content and suited the learners and the learning situation.

In addition, the training design was supported by the multimedia principles of Clark and Mayer (2016) and the Expanded Events of Instruction of Smith and Ragan (2005).

For example, the distinction between the three main instructional events, introduction, body and conclusion, helped structure the training and the videos in a consistent fashion (Smith & Ragan, 2005). An illustrative use of these events is the inclusion of reviews at the end of each video and at the end of the training. The videos summarized the main points of the content and are expected to have enhanced learning (Brar & van der Meij, 2016).

The training environment did not allow for formative assessments of separate instructional events, or the proper application of multimedia principles. Also, it was not possible to log the user's actions. Doing so could have revealed whether learners recalled the content immediately or whether they had to revisit content to answer questions. Future research should develop a learning environment that does enable this registration, which will fill this gap between expected results and actual results on learning.

Upon reflection, the Expanded Events of Instruction dominated in training design over the multimedia principles. A reason for this is the cohesive structure that this framework offers, which proved to be a great support for the design phase. Also, it was discovered that the multimedia principles were not always applicable. For example, the contiguity principle (Place printed words near corresponding part of graphic) and the modality principle (Use audio rather than on-screen text) are not always compatible. In each training design, the question arises which principles fit the needs and characteristics of that training best. In the present study, there was no use for the contiguity principle or the worked example principle (provide step-by-step demonstrations) as substantiated by guidelines from the NCCL- and content analyses.

The current training design is created from an informational perspective. This was considered a necessary first step. That is, the training was designed to provide journalists with (new) information that would describe the tasks and actions that

belong to the functions, responsibilities and impact of journalists reporting on scientific research. Providing this information was expected to raise awareness and thereby contribute to reflections on their attitude. To further increase their attitude, the training would need to add elements that have a strong persuasive appeal. For example, the current study worked with negative persuasion, but various theories of attitude change suggest add-ons to that negative persuasion content.

For instance, both Cognitive Dissonance Theory (Festinger, in Simonson & Maushak, 1996) and Social Judgement Theory (Sherif & Hovland, in Simonson & Maushak, 1996) revolve around providing persuasive information in relation to a person's own opinion. That is, when the training presents (new) information that contradicts that person's opinion, it creates an unbalance. To restore balance, the person is then likely to adapt his or her attitude (Festinger, in Simonson & Maushak, 1996). This persuasive measure works only when the new information is close to the person's opinions. When the contradictions are too large and the person becomes too unbalanced, he or she will object to changing the attitude (Sherif & Hovland, in Simonson & Maushak, 1996). In other words, the training should exercise great care in presenting contradictory information. For example, one possibility would be to present content in a simple-to-complex manner, so that learners can get accustomed to new information one step at the time.

Another possible supplementary measure that could contribute to attitude enhancement is presenting an incentive (Hovland, Janis & Kelley, in Simonson & Maushak, 1996). Incentives can either be financial or non-financial benefits, such as social acceptance, self-approval or knowledge gain. An example of an incentive mentioned in training could be: "*When you keep your responsibilities in mind when handling scientific press releases, your colleagues will be very satisfied with you and your work performance*".

6.1.2. Limitations

The first limitation of the training design is that self-directedness could have been further exploited. The training was linear and focused on verbal content, but presented in a visual way. This strained the fit between medium and content. Affordances for the non-linearity of instruction would allow for variations in the interaction with the instructional content which could have increased engagement and learning (Zhang et al., 2005).

Also, the authentic context in which video is suitable to present congruent information (van der Meij & van der Meij, 2014) has been unexhausted. Integrating authentic exercises would have created a larger sense of realism and therefore a more meaningful learning experience (Ertelt, 2007). For example, by actually having learners receive, scan and thoroughly read scientific press releases, their attitude might have changed more, due to direct experiences. Future online training for attitude enhancement should pay attention to non-linearity, user control and authenticity to create a more meaningful learning experience.

Another limitation of the training design is the lack of in-depth treatment of the topic. This is likely to be due to the low level of cognitive complexity in the set learning objectives. According to Krathwohl (2002), 'recalling' and 'recognizing' information is much less complex than e.g. 'understanding', 'analyzing' or 'creating' information. These more complex learning objectives would have led to more

coverage of the subject matter. Furthermore, this might have induced more active participants.

A third limitation of the training design is that the Graasp learning environment in which the online training was constructed and presented limited design options. For example, as the environment didn't allow for feedback on open questions, there was no possibility for open questions to be integrated into the training practice. Future training design should allow for a larger variation in assessment options and feedback.

A fourth limitation is that the training environment didn't allow for adaptivity on individual differences. The NCLL-analyses showed a variety in journalists in prior knowledge on scientific research. Had adaptivity been possible, then journalists with low prior knowledge could have received more support and journalists with high prior knowledge could have worked more self-directed. This way, the training would fit the target audience better, allowing some of them for an increased sense of autonomy and commitment. Future training design should pay attention to this.

6.2 Research Question 2: What is the effectiveness of the designed online training on the journalists' attitude towards handling scientific press releases?

In designing the SJAQ, the core content for the questions revolved around a mixture of content (behaviors) and type of attitude (cognitive/affective). This way, content and context are connected to the cognitive and affective appraisals to jointly construct a measurement of the attitude construct that is sensitive to theory and domain-specific. This capitalization and connection is supported by various motivational models which make use of similar exploitations (e.g. Brar & van der Meij, 2016). One psychometric quality of the SJAQ was derived from the outcomes from several reliability analyses, which showed moderate to high internal consistency.

In the effectiveness measurement, journalists were presented with awareness-raising information about their functions, responsibilities and impact as science journalists. It was expected that their attitude towards handling press releases, as an overarching construct, would increase. This expectation has been partly met. That is, all means in the post-training were higher than in the pre-training, suggesting that the training has enhanced the journalists' attitude. However, the pre- and post means of attitude towards handling press releases, as an overarching construct, differed not significantly. This indicates that the online training did not sufficiently enhance the journalists' attitude towards handling scientific press releases. Assuming that such a positive change is deemed desirable for the target audience, as the base-rate measure appears to indicate, this is disappointing. In addition, it is contrary to the expectations.

When looking at the behaviors 'receiving', 'scanning' and 'thoroughly reading' individually, a variation in effectiveness of training can be noted. That is to say, the behaviors 'receiving' and 'thoroughly reading' scientific press releases showed no significant change, again not in line with the expectations. However, the behavior 'scanning' scientific press releases did show statistical significance. Why only scanning favourably changed is unknown.

Different outcomes were also obtained for ‘affective appraisals’ as opposed to ‘cognitive appraisals’. The mean scores of ‘affective appraisal’ differed significantly. This finding is in line with Ajzen and Fishbein (2005) who states that attitude change can be achieved through responding to a person’s affective appraisal. Still, ‘cognitive appraisal’ did not differ significantly, which does not confirm the expectations. Why only affective appraisals were influenced by the training is unknown.

Whereas the effectiveness of the training on overall attitude enhancement may have not been proven in this study, the usability of the training was assessed as high, as indicated by the SUS-analyses. That is, the answer to the third research question is that the respondents’ experience with the usability of the training was pleasant, which indicates that its training design fitted the target audience for which it was designed.

6.2.2 Limitations

A limitation of this study is the small sample size. The response rate is very low and the dropout rate is high. Quite often respondents indicated not to have performed the behavior involved in the items in the last three months. Unfortunately, some respondents were unable to complete the training and questionnaire due to technical problems on their side, which caused them to drop out. The question arises why respondents signed up to participate. It might be possible that these respondents were more interested in science journalism than the ‘average’ journalist, which could imply that the respondents started off with a positive attitude towards handling scientific press releases. Further research on a much larger scale should provide more insight into attitude enhancement through training.

Another limitation is the absence of log files in training participation. That is to say, it is not certain that the respondents who completed the second questionnaire actually completed the entire training, or participated in it at all.

Another limitation is that only attitude towards the behavior is measured. Attitude theory indicates that subjective norm and perceived behavior control should be taken into account to get a full grasp of what determines behavioral intention and action (Ajzen & Fishbein, 2005). For instance, attitude theory claims that some behaviors are influenced primarily by attitude, whereas others are influenced more by subjective norm or perceived behavioral control. In short, future research on the effect of online training on enhancing attitude should also measure the participant’s subjective norm and their perceived behavioral control.

As mentioned earlier, science journalists operate in three functions; as an information provider, medium and watchdog. These functions were integrated in the online training content, where focus was put on making the learners aware of their functions, responsibilities and impact when operating as science journalists.

The three behaviors ‘receiving’, ‘scanning’ and ‘thoroughly reading’ scientific press releases were centralized in this attitude study. This was a good starting point, but the results call for refinement. The three behaviors were not integrated into the training content as much as initially desired. As mentioned earlier, actually having the learners perform ‘receive’, ‘scan’ and ‘thoroughly read’ scientific press releases could have been more important for affecting their attitude towards these behaviors.

Also, the three functions discussed in the training content are more concrete and better aligned to the actual daily practice of journalists within the organization than the three behaviors are. This raises the question whether it would have been better to measure the journalists' attitude towards these functions next to, or instead of, the attitude towards the behaviors. Future research might want to use attitude questionnaires that address the combination of the three behaviors and three functions. For example, the original item on 'thoroughly reading' could be connected to the function 'watchdog' as follows:

Original: *I think thoroughly reading scientific press releases is important*
Suggestion: *When my goal is to critically observe science, I think thoroughly reading scientific press releases is important*

Or the other way around:

Original: *I think thoroughly reading scientific press releases is important*
Suggestion: *When thoroughly reading scientific press releases, I think critically observing science is important*

6.3 Conclusion

The current study has designed and tested an online training on attitude enhancement of journalist. The usability of the online training was liked by the respondents, but the effectiveness measurement did not support the expectation that attitude towards 'receiving', 'scanning' and 'thoroughly reading' scientific press releases was significantly enhanced by the training. Nonetheless, the findings are hopeful that future trainings may do evoke this enhancement.

Future training designs should probably provide more in-depth information and more dynamics in its design, to stimulate learner activity and therefore learner attitudes. In these efforts attention should be given to make sure that the measurement instruments and the training content are more in line with each other. The instruments should continuously respond to both cognitive and affective components of attitude. Besides that, future trainings should be evaluated at a much larger scale, to be able to draw stronger conclusions. For now, the present design is only a first step towards designing an online training to enhance the attitude of journalists with regard to handling scientific press releases.

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Appendices

Appendices can be requested via the researcher.