Do Work Placement Tests Challenge Student Trainees to Learn?

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Abstract. The study described in this article shows that embedding formative work placement tests in the student's learning process facilitates the student's development while on the work placement. This study measured the development of the student's learning process by determining the extent to which students gained an understanding of their current and desired levels of knowledge, felt challenged to learn, and more deeply explored the specialism of their work placement department. The exchange of knowledge between the student trainee and the work supervisor was measured. The E-Flow Nursing project was used as a case study. In this project, it was agreed that students were to include their test results in their personal activity plans, in line with recommendations from previous research into formative testing in general, which had revealed that formative testing can lead to positive developments in the learning process provided that it is embedded in the learning process.

Keywords: Digital formative work placement tests**,** Learning process**,** Nursing students.

1 Introduction

In the fields of education and science, the importance of digital testing at the student trainee's work place is being recognised more and more. Digital testing provides both student and lecturer with insight into academic performance. Provided a digital test is psychometrically sound, it can be an effective tool for increasing the level of knowledge of student trainees. However, it needs to be combined with a number of additional measures [6].

Digital testing has not been entirely without criticism. For example, the results of the 'Building Bridges' project revealed that the expectations raised by the test were too rarely met by student trainee nurses at the higher professional education level. The test alone is not enough if the digital test is to help optimise work placement supervision [6]. Both the trainee nurses and the work supervisors report that the test is still not sufficiently well regarded as a more effective means of preparing for the work placement. The results show that additional steps are required if the digital test is to benefit the structure of the student's learning process as well as the work placement supervision performed by the work supervisor [6]. It is expected that student trainees

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will be better able to address gaps in their knowledge (and draw up appropriate action plans for addressing these gaps) if the test results are included in their Personal Development Plans (PDP), Personal Action Plans (PAP) or Work Placement Plans, and if they discuss these results with their work supervisors and fellow students [6].

Another important point is that the digital work placement test must be only one of a number of interventions in the learning process, and not a stand-alone element. The learning pathway must be designed so that not only does it get the best out of the student, but also has educational benefits for the work supervisors [6]. The E-Flow Nursing project, the case study in this article, elaborates on the expectations arising from the above studies and has embedded the intervention, namely the digital formative work placement test, more deeply in the student trainee's overall supervisory process.

2 Theoretical Framework

Tests are usually divided into two different categories: summative and formative. The aim of summative testing is to assess academic performance, whereas the aim of formative testing is to gain an insight into the learning process and to make adjustments where necessary [5]. Cilliers et al. [2] claim that carrying out formative tests enhances the learning process. It has become clear that formative knowledge testing has a positive effect on the student's learning outcome, on condition the answers provided to students are accompanied by feedback [1], [3].

According to Black & William [1], a formative test is an effective and valid tool for boosting students' learning outcomes, provided students receive feedback on their answers. It is important that students gain an understanding of their own shortcomings. According to Dousma, Horsten and Brants [3], the greatest advantage offered by a formative test is that it allows students to adapt their learning at an earlier stage. The formative test is advantageous for the learning process if students receive feedback on their answers.

The study carried out by Dijksterhuis et al. [4] shows that feedback, the credibility of feedback and a supporting learning environment with work supervisors are key factors for active student involvement in doing formative tests. A study by Rotterdam University of Applied Sciences [7] demonstrates that students and work supervisors view formative tests as an excellent way to prepare for the work placement. Where formative work placement tests are used, it is important to deploy subsequent interventions to ensure that students and supervisors actually work on the test.

Samuels and Uil [8] studied the knowledge level of student trainee nurses. A key finding of their study was that student trainee nurses have insufficient knowledge to begin their work placements responsibly. Four hospitals therefore decided to improve student trainees' grasp of theory prior to the work placement, and to introduce a work placement test. This work placement test improves students' basic knowledge. Moreover, the test provides greater clarity with regard to the work placement department's expectations. The evaluations reveal that taking work placement tests motivates students to prepare better for their work placements [8].

According to the above studies, in order for formative tests done during work placements to positively impact a student's development, they must form part of the student's learning process as well as the work supervisor's supervisory process. 'Positive development' is understood as referring to 'students' insight into their current and desired levels of knowledge in the work placement department', whereas 'a positive effect on the learning process during the work placement' refers to being challenged and motivated to learn, as well as undertaking 'in-depth study of the specialism in the work placement department'. In terms of the supervisory process, 'development' can be defined as 'contributing to the exchange of knowledge between student trainees and work supervisors'. The research questions we therefore aim to answer in this article are the following:

- To what extent does a formative test contribute to students' insight into their current and desired levels of knowledge?
- To what extent does a formative test have a positive effect on the students' learning process?
- To what extent does a formative test have a positive effect on the in-depth study of the specialism?
- To what extent does a formative test contribute to the exchange of knowledge between student trainees and work supervisors?

3 Digital Work Placement Tests within the E-Flow Nursing Project

The case study used in this study was the E-Flow Nursing project. The objectives of the E-Flow Nursing project are to develop a consistent, workplace-independent, digital test for 3rd and 4th-year senior secondary vocational education (MBO) nursing students, 1st and 2nd-year higher professional education (HBO) nursing students (without an MBO qualification in nursing) and 3rd and 4th-year higher professional education (HBO) nursing students (with an MBO qualification in nursing). The tests focus on both knowledge and attitude development as well as students' insight into their future professional careers as nurses in general hospitals (AGZ), care for the disabled (GHZ), psychiatry (GGZ) and care for the elderly (OZ).

The E-Flow Nursing project employed an approach whereby nurses from a work placement department prepare tests with specific questions about their department. These are the nurses who also supervise the student trainees. The *Leerstation Zorg* digital test bank is used during this process. This test bank contains more than 13,000 practice-based questions about various healthcare specialisms. This number is continuously updated and supplemented with new test items. The questions address knowledge, attitude and insight.

3.1 The Initial Test

Doing the test forms part of the student's preparations for the work placement. The rule 'No E-Flow, No PAP' was introduced for this purpose. The test level is equivalent to the knowledge level of a nurse with two years' work experience. By doing the tests, the students gain an understanding of what to expect in the work placement department in terms of subject areas. After answering each question the student sees a 'knowledge flash': a brief explanation of the question and the correct answer. The most recent source of the information concerned is also referenced.

3.2 Insight into Results

The student and the supervisor do the test on the work placement department prior to the work placement, and are the only ones who have access to their own results. Students include their result in their PAP or Work Placement Plan. The student and supervisor discuss the result during their introductory meeting in the work placement department. This encourages students and their supervisors to discuss the desired level of knowledge for the trainee, as appropriate to his or her phase in the learning process. They jointly discuss which learning objectives the student trainee is going to work on during the work placement period. The student may work on achieving these objectives through catch-up tests, by studying the relevant professional literature or by discussing the objectives with the supervisor (Table 1, section C).

3.3 Catch-Up Tests

Catch-up tests are short tests centred around repetition: the student chooses a number of subjects that he or she wants to practise. The student then does short tests, consisting of ten questions per subject. These tests assess basic knowledge of the subjects selected. If the student's score is too low, he or she is automatically presented with a new test on the same subject. The standard is determined on the basis of the average test score. The level of difficulty of the second test equals that of the first. Through a process of repetition, the student practises and reduces his or her knowledge gaps in this subject.

3.4 Final Test

At the end of the work placement, the students and their supervisors have the option of doing the initial test again in order to compare the results and give both student and supervisor an idea of how the student's knowledge has developed over the course of the work placement. When discussing the test results during the final work placement interview, the student and supervisor could agree to new learning objectives to be pursued as the student continues his or her study programme or during a possible follow-up work placement.

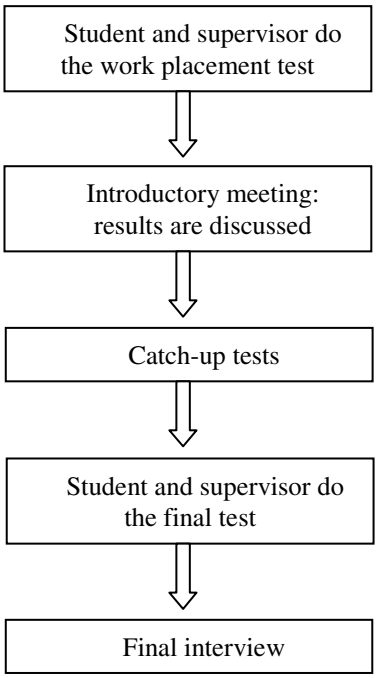

Fig. 1. E-Flow Nursing digital work placement test

4 Research Method

A quantitative study was carried out. In the period 4 January 2013 to 13 March 2014, written questionnaires were conducted among the students and supervisors following completion of the formative test as part of the work placement. The data was collected from MBO and HBO Nursing programme students at a Regional Training Centre or higher professional education institution in the Groningen, Drenthe and Noord-Overijssel region. These were 3rd and 4th-year MBO nursing students and 2nd, 3rd and 4th-year HBO nursing students. Questionnaires were also conducted among the work supervisors who supervised these students during their work placements. These supervisors were employed at a healthcare institution in the Groningen, Drenthe and Noord-Overijssel region, and worked in one of the following sectors: general hospitals (AGZ), care for the disabled (GHZ), psychiatry (GGZ) and care for the elderly (OZ).

The measuring tool used was a written questionnaire. This questionnaire was conducted previously during the 'Building Bridges' project (Rotterdam University of Applied Sciences, 2011). Two types of questionnaire were used: one for students and one for supervisors. All items were measured on a scale of 1 (= strongly disagree) to 5 (= strongly agree). To determine the extent to which the formative test influences the variables, the items were merged into three sub-scales for students. Table 1 shows sub-scales A, B and C for students.

Table 1. Scales and items (students)

Scales: insight into the current and desired levels of knowledge, positive effect on the learning process, in-depth study of the specialism
A. Insight into the current and desired levels of knowledge
Doing the work placement test ..
has made me aware of my current level of knowledge of the specialism
has made me aware of the desired level of knowledge of the specialism
has made it clear to me what I need to know in order to understand syndromes and their treatment
has made it clear to me what I need to know in order to account for my actions
has made it clear to me what I need to know in order to provide the patient/client with the right information
has made me aware of what I need to know in order to contribute to the exchange of knowledge with colleagues
means that I can focus during my work placement on increasing my level of knowledge within this specialism
has made me acquire more knowledge about this specialism
means that I can ask my work supervisor for specific help in acquiring knowledge
B. Positive effect on the learning process
Doing the work placement test has ...
had a positive effect on my learning process
had a positive effect on my work placement
challenged me to learn
motivated me more for my work placement within this specialism
motivated me to study the specialism in greater depth
C. In-depth study of the specialism
I prepared for the work placement test by studying theory
Having done the work placement test, I will now gather information specifically to fill the gaps in my knowledge
Having done the work placement test, I will now study the specialism in greater depth by talking to my work supervisor about the specialism
Having done the work placement test, I will now study the specialism in greater depth through reading relevant literature
I will prepare myself better for the final test
Because I will gain experience within the specialism during my work placement, I expect to obtain a higher score in the final test than in the first work placement test
Having done the work placement test, I studied the specialism in greater depth by talking to fellow students about the specialism

To measure the extent to which students gain greater insight into their current and desired levels of knowledge, nine items were merged into sub-scale A. Current and desired level of knowledge. Cronbach's alpha > 0.79 allows us to assume that these items can be merged into a single sub-scale. It included items such as "Doing the work placement test has made me aware of my current level of knowledge of the specialism", "Doing the work placement test has made me aware of the desired level of knowledge of the specialism" and "Doing the work placement test has made it clear to me what I need to know in order to understand syndromes and their treatment".

To measure the extent to which the learning process was positively affected, five items were merged into sub-scale B. Positive effect on the learning process. Cronbach's alpha > 0.94 allows us to assume that these items can be merged into a single sub-scale. It included items such as "Doing the work placement test has had a positive effect on my learning process", "Doing the work placement test has had a positive effect on my work placement" and "Doing the work placement test has challenged me to learn".

In-depth study of the specialism was measured using eight items (sub-scale C). Cronbach's alpha > 0.90 allows us to assume that these items can be merged into a single sub-scale. It included items such as "Having done the work placement test, I will now study the specialism in greater depth by talking to my work supervisor about the specialism" and "Having done the work placement test, I will now study the specialism in greater depth through reading relevant literature".

To determine the extent to which knowledge is exchanged as part of the supervisory process, items from the questionnaire for supervisors were merged into the two sub-scales D and E. See Table 2. To measure the extent to which knowledge is exchanged between supervisor and student as a result of the test, five items were merged into sub-scale D. Knowledge exchange. Cronbach's alpha > 0.80 allows us to assume that these five items can be merged into a single sub-scale. It included items such as "The work placement test helped me to exchange knowledge with the student" and "The work placement test has helped me to supervise the student's knowledge development more effectively".

To measure the supervisors' views as to whether the formative test has a positive effect on the learning process, ten items were merged into sub-scale E. Positive effect on the learning process. Cronbach's alpha > 0.81 allows us to assume that these ten items can be merged. The sub-scale included items such as "I feel that doing a work placement test is part of proper preparation for the work placement", "I feel that the questions in the work placement test are relevant to my specialism", "I expect that doing the work placement test will challenge the student to learn".

Table 2. Scales and items (supervisors)

Scales: knowledge exchange and positive effect on the learning process
D. Knowledge exchange
I expect that doing the work placement test will ensure that the student is able to ask me for specific help in acquiring knowledge
The work placement test has helped me to exchange knowledge with the student
The work placement test has helped me to supervise the student's knowledge development more effectively

Table 2. (*continued*)

Scales: knowledge exchange and positive effect on the learning process
Doing the work placement test myself has helped me to exchange knowledge with the student
Doing the work placement test myself has helped me to supervise the student's knowledge development more effectively
E. Positive effect on the learning process
I feel that doing the work placement test is informative for a student within my specialism
I feel that the work placement test accurately reflects the content of the specialism
I feel that a work placement test should be compulsory for every work placement
I feel that doing a work placement test is part of good preparation for the work placement
I feel that the questions in the work placement test are relevant to my specialism
I expect that doing the work placement test will challenge the student to learn
I expect that doing the work placement test will motivate the student
I expect that doing the work placement test will have a positive effect on the student's learning outcomes
I feel that the work placement test encourages the student to study the specialism in more depth
I feel that the work placement test motivates the student for a work placement within this specialism

5 Results

The questionnaire was completed by the students and supervisors who did the tests in E-flow Nursing. The test was done by a total of 1102 students, of whom 559 also completed the questionnaire. This is a response rate of 50.70%. Questionnaires were also completed by the students' supervisors. The test was done by a total of 333 supervisors, of whom 148 completed the questionnaire. This is a response rate of 44.4%.

The results in Table 3 show that students indicate that the formative test provided them with greater insight into the current and desired levels of knowledge (average score of 3.53 on a scale of 1 to 5). They also indicate that the formative test had a positive effect on the learning process (average score of 3.4 on a scale of 1-5). Finally, students indicate that doing the test enabled them to specialise more in the specialism (average score of 2.96 on a scale of 1-5).

To measure the link between insight into current and desired levels of knowledge, the positive effect on the learning process and the in-depth study of the specialism, a correlation coefficient (Pearson R) was used to test whether a linear relationship exists between the three scales. The Pearson R correlations in Table 3 show that there is a significant positive relationship between these three variables. A particularly strong relationship

exists between 'Learning Process' and 'In-depth Study of the Specialism', with a correlation of 0.83. This demonstrates that, in addition to the formative test having a positive effect on the three elements, the three elements are also connected.

Table 3. N, averages, standard deviations, range, missing values and correlations between scales A, B and C

	N	M	SD	Range	Missing values	Insight into the current and desired levels of knowledge	Learning process	In-depth study of specialism
Insight into the current and desired level of knowledge	549	3.53	0.59	1-5	10	1	0.57**	0.49**
Learning process	543	3.40	1.12	1-5	16	0.57**	1	0.83**
In-depth study of specialism	550	2.96	1.05	1-5	9	0.49**	0.83**	1

** = p<0.01 (2-sided)

The work supervisors indicate that the formative test led to a greater exchange of knowledge with the students (average score of 3.68 on a scale of 1-5). Work supervisors also indicate that the formative test has a positive effect on the learning process (average score of 3.84 on a scale of 1-5).

To measure the link between knowledge exchange and positive effect on the learning process, a correlation coefficient (Pearson R) was used to test whether a linear relationship exists between the two scales. The Pearson R correlations in Table 4 show that there is a significant positive relationship between these two variables, with a correlation of 0.54. It can be deduced from this analysis that a connection exists between the exchange of knowledge between work supervisors and students and a positive effect on the learning process.

Table 4. N, averages, standard deviations, range, missing values and correlations between scales D and E

	N	M	SD	Range	Missing values	Exchange of knowledge	Positive effect on the learning process
Exchange of knowledge	144	3.68	0.90	1-5	4	1	0.54**
Positive effect on the learning process	145	3.84	0.63	1-5	3	0.54**	1

** = p<0.01 (2-sided)

6 Conclusion and Discussion

The study described in this article examined the embedding of a formative work placement test in the learning process of MBO and HBO Nursing students, based on expectations from previous research. The case study for this research is the E-Flow Nursing project. In this project, a digital work placement test was deployed as an intervention as part of the learning process. A key rule was 'No E-Flow, No PAP/Work Placement Plan'. The aim was for students to incorporate the results of the knowledge test into their learning objectives and activities during the work placement, and to discuss them with their work supervisor. The measurement tool employed, the questionnaire, was used previously in a similar project, in which the formative test did not form part of the learning process but was instead a stand-alone element. It was expected that since the formative test was now embedded in the learning process, it would indeed lead to development in the learning process, namely the acquisition of greater insight into the current and desired levels of knowledge, a positive effect on the learning process and more in-depth study of the specialism in the work placement department. It was furthermore expected that knowledge would be exchanged between the student and the work supervisor.

The results confirmed these expectations, with both students and work supervisors giving positive assessments. Students indicate that they have greater insight into the current and desired levels of knowledge, that the test has a positive effect on the learning process and that they have started studying their respective specialisms in greater depth. The supervisors indicate that more knowledge is exchanged and that the test has a positive effect on the students' learning process. There is also evidence of a significant positive relationship between the three scales 'insight into the current and desired levels of knowledge', 'positive effect on the learning process' and 'in-depth study of the specialism'. The strongest relation exists between 'in-depth study of the specialism' and 'positive effect on the learning process' in the case of students. The study demonstrates that students believe that doing the formative tests has resulted in studying their respective specialisms in greater depth and that they consequently experienced the tests as having a positive effect on their learning process. The students also experience this effect on their insight into the current and desired levels of knowledge, though less strongly.

7 Scientific Contribution

This study has contributed to scientific research by confirming that embedding the formative knowledge test in the learning process results in enhanced development, more insight on the part of the student into his or her starting situation (the current and desired levels of knowledge), greater motivation by the student to study the respective specialism in more depth, and a positive effect on the learning process.

This study also has methodological limitations, however. This study used a questionnaire to measure how the student and supervisor experienced development in the learning process. Consequently, the study measured the development as experienced and not the progress in that development. There may be some degree of distortion due to a tendency by respondents to give socially desirable responses.

The average test scores were not analysed for this study since the objective of the intervention, formative testing, is to provide students with insight into the learning process, and adapt it where necessary. The assessment of academic performance is an objective of summary testing, which was not the intervention investigated. Furthermore, the results of the catch-up tests were not analysed since the students were not obliged to take these tests. The students were free to decide how they worked on filling their knowledge gaps through, for example, reading the professional literature or engaging in discussions with their supervisors. Although students indicated, for example, that they went about collecting more information, the study did not verify how the students went about collecting this additional information. More in-depth research into the activities that students undertake would be interesting as it would provide insight into student behaviour and action when it comes to actual learning.

For these reasons it was decided that in order to answer the research questions formulated for this study - the extent to which a formative questions contributes to insight, the learning process, deepening of knowledge and knowledge exchange - the study should measure how students and supervisors perceived the items.

The students and supervisors were analysed as two research groups. The supervisors were asked to give their opinion about the use of formative testing in general, and not in respect of individual students. Since the supervisors often supervised three to four students, it was not possible to link the results of supervisors to the results of the students. In the event of a follow-up study, this would be an interesting link to monitor, in combination with the activities undertaken by the students and the feedback provided by the supervisors.

Finally, a follow-up study would yield valuable information if it measured whether the use of formative tests combined with supervisor feedback and student learning activities resulted in better study results (summative testing). This would require a longitudinal study linking test results, study results, and student and supervisor perceptions.

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