

## DIAGNOSTICS OF DIDACTIC COMPETENCIES OF STUDENTS OF FACULTY OF PHYSICAL EDUCATION AND SPORT

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**Summary.** Physical education has been the subject of research for a long time. Research focuses most often on the use of time to get pupils to move actively or on their physical load during a lesson. The evaluation of the didactic interaction of the teaching student - pupil(s) is also an essential area of research. The aim of the paper is to introduce the MADI method and its subsequent use in the evaluation of didactic outputs of teaching students in subjects focused on the didactics of swimming. The method Analysis of Didactic Interaction (ADI) has been modified to assess didactic interactions between the teaching (student) - pupil(s). Modified Analysis of Didactic Interaction (MADI) was created by reducing the number of monitored categories and focusing attention on the activity of the student. The achieved results showed that the most frequent form of behaviour among the students was observation followed by instruction. This influenced both the form of their manifestations, dominated by silence, and the overall manifestation, which was neutral and mostly without material significance. In terms of activities that have been the subject of didactic interaction, students have been taught these activities. The results obtained show that the chosen method seems to be effective for evaluation of didactic output of teaching students. A deeper analysis of student didactic outcomes can contribute to influencing the quality of student didactic competencies. At the same time, it can also serve as a feedback tool on their didactic activities for their faculty teachers.

**Key words:** Key words: didactic interaction, communication, didactic competence, modified analysis of didactic interaction, swimming.

## Introduction

In the professional education of future Physical Education teachers at Charles University FTVS, the syllabi of swimming subjects in the bachelor study program are focused on acquiring the skills of swimming locomotion, but also on the didactics of swimming methods and diagnostics of movement in water. Teaching of swimming didactics focuses on acquiring and developing student's didactic competences in the field of swimming teaching and swimming sports. Through the didactic outputs on a given topic, teaching students have the task of creating their own written lesson preparation for the teaching unit and then implementing it themselves. At the end of the lesson they are evaluated by faculty teachers. Given the time available for this evaluation, the feedback is focused more on the evaluation of didactic output as a whole. However, if we want to provide students the deeper feedback on their didactic impact, their didactic outcomes need to be analysed in more details. Particular attention should be paid to the evaluation of the teacher-pupil interaction, which will reveal the most frequently occurring characteristics in terms of the forms of teacher's behaviour, its manifestation or the type of activity that is the subject of the didactic interaction.

Didactic interaction means everything that happens between the participants of the didactic process and what is essential in terms of their interaction and the desired effect (Dobry et al., 1996). Research on monitoring and subsequent analysis of teacher's behaviour in relation to pupils has a relatively long history. The first references are from the beginning of the last century. One of the leading authors who contributed with his ideas to the research of interaction on a global scale was N. A. Flanders. His Flander's Interaction Analysis System (FIAS) (1967a; 1967b; 1970) is one of the best-known categorical observation systems. The method was originally created for science subject research. The FIAS has undergone several transformations. One of the major changes was made by Galloway (1970), when he extended the 10 categories originally contained by FIAS to include non-verbal communication. Probably the best - known method of interaction analysis is CAFIAS - Cheffers Adaptation of the Flanders Interaction Analysis System (Cheffers 1977). Cheffers is one of the main theorists and initiators of interactive research in physical education. He considers interaction analysis to be a systematic record of the spontaneous behaviour of a teacher in their interaction with pupils, with minimal observer's error (Muzik et. al. 2013). Other figures involved in teacher's activity research who have influenced the development of didactic interaction analysis include R.F. Bales (1950), A. Bellack et al. (1966) and A. Bellack (1968).

The development of interaction research was also carried out in Czechoslovakia and later in the Czech Republic. As a result, methods of Systematic Observation of Interaction - SPIN (Svoboda & Kocourek 1987), Categorical Video Recording Assessment System - KPSV (Jansa 1987) and Analysis of Didactic Interactions - ADI (Dobrý et. al. 1996). It is a method that uses recording and computing techniques and a categorical assessment system to obtain empirical data about participants in physical education training. The original ADI was simplified by reduction of certain categories for the purposes of evaluating the pedagogical outputs of the Charles University FTVS students in the Didactics of Sporting Games subject. Only those that Süss & Marvan (2009) considered important didactic skills to acquire were retained. This modified ADI was called Modified Didactic Interaction Analysis (MADI).

The aim of the paper is to introduce the MADI method and its subsequent use in the evaluation of didactic outputs of teaching students in subjects focused on the didactics of swimming. Within the subject Theory and Basics of Swimming Didactics were realised didactic outcomes of students on the given topic. The didactic competencies of students were assessed using the MADI quantitative method.

## **Methods**

The examined population consisted of students from the 2nd grade of the bachelor's degree program Physical Education and Sport, in the subject Theory and Basics of Didactics of Swimming at Charles University FTVS. In total 104 students participated in the research. The data was collected during the winter semester of the academic year 2015/2016. For organisational reasons, it was not possible to make audio and video footage of all the didactic outputs of the students that year. Therefore, we decided to select 30 students by simple randomisation. As a technique for this simple randomisation, we chose random numbers in published random number tables (Hendl & Remr 2017). From the recorded audio and video recordings of the selected students, their interaction profile was determined using the MADI method.

Didactic outputs of teaching students were carried out under the subject Theory and Basics of Didactics of Swimming. The length of each lesson was forty-five minutes. Thirty-five minutes was reserved for didactic outcomes of teaching students and in the remaining 10 minutes the outcomes were evaluated by their faculty teacher. The thirty-five-minute presentation was made by 3 teaching students (the 1st student led the introductory and

preparatory part, the 2nd student the main part and the 3rd student the final part of the lesson). The student who led the fixed part of the lesson was always in the role of “leading teacher”. The other two students, who were not in the position of 'lead teacher' at the time, were 'assistants'. These “assistants” were also involved in the didactic output. Their task was, for example, to correct “pupils” or to provide adequate feedback. For technical and organisational reasons, it was not possible to provide swimming lessons to real pupils of primary schools within this subject. These pupils are thus replaced by other teaching students from the group who do not have a didactic output on that day (designated “pupils”).

The study had the character of descriptive research based on the qualification of observation using a categorial system. The categorial system of Modified Analysis of Didactic Interaction (MADI) was developed based on the method of Analysis of Didactic Interaction (ADI). The MADI method (Süss & Marvanová 2009) was created for the evaluation of student’s pedagogical outcomes in the Didactics of Sporting Games subject. The main difference from the original ADI was the reduction of categories to those that are most important for teaching student’s learning didactic skills. This eliminates the complicated training required by ADI. A positive feature of the MADI method is the possibility of recording didactic outputs using video and subsequently simple coding in the computer program MS Excel.

Individual categories and subcategories of Süss & Marvan (2009):

*Category 1* - forms of teacher’s behaviour: instruction, correction, feedback, observation, notification, question, reception, assessment, participation, unclear situations.

*Category 4* – Forms of teacher's speech: speech, speech and locomotor manifestations, movement associated with silence, non - verbal acoustic expression, silence, others.

*Category 5* - is divided into two parts:

a) Level of expression of content: Yes/No.

b) Types of attitudinal activity: integrative, dominant, neutral.

*Category 6* - types of activities that are the subject of didactic interaction: teaching activities, organisational activities, other.

*Categories 7, 8 & 9* - types of pupil activities, groups, classes determining the current relationship of teachers in didactic interaction: direct reception, indirect reception, performance of activities under direct control, performance of activities without direct control, answer.

*Category 2* in the ADI is devoted to the activities of pupils, *Category 3* refers to the activities of a group of pupils. The modified form of ADI focuses mainly on the forms of teacher behaviour and therefore we do not include both categories.

### *Statistical Processing*

The results of the evaluation of didactic outputs of students using MADI are given in absolute and relative frequency, which is given in percentages. For the purposes of our research, we have also used descriptive statistic averages (mean %) and standard deviation.

## **Results**

Summary results of students in Category 1 (Table 1) showed that the most used form of behaviour was observation (45.4 %). This is mainly attributed to the organisation of swimming lessons, where "pupils" took some time to swim over the twenty-five-metre pool with exercises that the teaching student has set. Then at that moment passed to the other side of the pool and observed. We did not consider the high percentage for observation to be an entire error. There is some testimony of how much active and passive time "pupils" spent in the water. Instruction was the second most popular subcategory in our research (35.0 %). It included all the instructions that were directed towards the "pupils" by the teaching students. The relatively frequented form of student's behaviour during didactic outputs was also unclear (9.1 %). We included, for example, situations in which the teaching students read their written preparation, communicated with their assistants or whether the didactic output was interrupted by a faculty teacher (security), etc. Surprisingly a low percentage was recorded for correction (2.1 %) and feedback (1.2 %). Although these are quite fundamental forms of teacher's behaviour, we attributed this small percentage to the didactic outcomes of students, especially their pedagogical "inexperience" (these are their first didactic outcomes at Charles University FTVS). Another reason may be the organisation of the swimming lessons by themselves.

**Table 1**  
*Summary assessment of students in Category 1 of MADI - forms of teacher behaviour*

<b>Subcategories</b>	<b>Average %</b>	<b>Standard deviation</b>
Instructions	35.0	8.2
Corrections	2.1	2.1
Feedback	1,2	1,8
Observation	45.4	8.3
Notifications	4.3	3.2
Questions	1.7	1.6
Reception	0.8	0.9
Assessment	0.5	0.9
Participation	0.0	0.0
Unclear situations	9.1	5.5

The results of the analysis of didactic outputs in Category 4 (Table 2) are in accordance with the forms of teacher's behaviour (Category 1). Silence (38.8 %), which was the most common form of communication that a teacher utilised, is related to observation that was most frequently used in the first category. The same connection can also be seen in speech (32.8 %) with instruction, which was also the second most popular subcategory. Higher values were also observed for physical activity associated with silence (13.8 %), which included particular situations where teaching students were moving from one side of the pool to the other and observing "pupils", and speech and physical activity (13.0 %), when the teaching students presented instruction to the pupils, these were supplemented with movement demonstrations from the edge of the pool. Other subcategories (1.4 %) and nonverbal acoustic manifestations (0.1 %) occurred minimally.

**Table 2**  
*Summary assessment of students in Category 4 of MADI - forms of teacher speech*

Subcategories	Average %	Standard deviation
Speech Display	32.8	7.8
Displays of Speech and Movement	13.0	8.3
Movement Associated with Silence	13.8	9.5
Nonverbal Acoustic Displays	0.1	0.3
Silence	38.8	8.8
Other	1.4	3.7

In terms of materiality of expression of the teaching students (Table 3), the analysis showed that more than half of the teaching students' manifestations were neutral (60.4 %) and without material significance (58.6 %). Again, the link with Category 1 is reflected. In most cases, observation was neutral and without material significance. Similarly, an instruction that contains material significance was usually integrative.

**Table 3**  
*Summary evaluation of students in Category 5 of MADI*

Subcategories	Average %	Standard deviation
<i>Does speech contain material significance?</i>		
Yes	41.3	7.4
No	58.6	7.4
<i>Is it an integrative or dominant expression?</i>		
Integration	23.3	6.8
Dominant	16.3	6.2
Neutral	60.4	8.2

In Category 6 (Table 4), teaching students were predominantly learning, i.e. situations where teaching students gave instructions to the pupils, announced further steps or provided correction or feedback. Organisational activities (28.8 %) included the organisation of pupils in the water, teaching students moving around the pool without observation, or giving swimming aid to “pupils”. At 11.2 % we noticed another activity where teaching students read their written preparation, communicated with their assistants at the edge of the pool, etc.

**Table 4**  
*Summary evaluation of students in Category 6 of MADI - types of activities that are the subject of didactic interaction*

Subcategories	Average %	Standard deviation
Learning Activities	60.1	19.3
Organisational Activity	28.6	13.8
Other	11.2	15.2

The following categories (7, 8, 9) were related to the types of activities of the pupil, group and class (Table 5). Category 7 students did not use much, which corresponds to relatively low values: performance of activities under direct control - 1.3 %, own initiative - 0.6 % and direct reception - 0.3 %. This is mainly due to the organisation of teaching, where teaching students worked mainly with a group of "pupils" or with the whole class. In Category 8, the highest subcategory percentage was activity of the group under direct control (28.6 %). In majority of cases, this was a situation where the teaching students started the "pupils" in groups (3 – 5 "pupils") from the pool wall to perform given activities. The rest of the class was at that time undertaking activities of indirect reception or without direct control (see Category 9). The direct reception of the group, i.e. the teaching student that spoke to the whole class, devoted the content of communication to only one group (e.g. swimming the width of the pool), was recorded at 6.7 %. A smaller percentage represented the group's performance without direct control (1.6 %). In this case, the "pupils" swam alone, while the teaching students turned to the rest of the class (see Category 9, subcategory Direct Reception). In Category 9, the subcategory with the highest percentage was Direct Reception of the class (29.3 %), i.e. the scenario when the teaching students communicated with and listened to the “pupils”. A high percentage of representation also appeared in the performance of the class under direct control (27.4 %), when the entire class was under the direct control of the teaching student. During analysis, we again noticed the performance of class activity without Direct Control (22.5 %) – the attention of the teaching students was devoted to the group of "pupils" while the rest of the class continued to

carry out the activity Indirect Reception (20.7 %). The subcategory Response did not appear at all in the analysis of student didactic outputs.

**Table 5**  
*Overall evaluation of students in Category 7, 8 & 9 of MADI – other types of activities of pupils, groups and classes*

	<b>Category 7</b>		<b>Category 8</b>		<b>Category 9</b>	
<b>Subcategories</b>	<b>Average %</b>	<b>Standard deviation</b>	<b>Average %</b>	<b>Standard deviation</b>	<b>Average %</b>	<b>Standard deviation</b>
Direct Reception	0.3	0.7	6.7	5.2	29.3	8.3
Indirect Reception	0.0	0.0	0.3	1.1	20.7	16.6
Performance of Activities under Direct Control	1.3	1.7	28.6	14.2	27.4	12.9
Activity without Direct Control	0.0	0.0	1.6	2.0	22.5	14.4
Answer	0.0	0.1	0.0	0.0	0.0	0.2
Own Initiative	0.6	1.0	0.2	0.3		

## Conclusion

The results show that the MADI method appears to be suitable for the evaluation of didactic outputs of teaching students in swimming. However, this method is not intended for students to provide deeper feedback on their didactic outputs. At the same time, it can also be used by their faculty teachers for reflection of their didactic influence on their students. However, the results we achieved in our research are only indicative. They cannot be applied to the entire Charles University FTVS student population.

The evaluation of student didactic outcomes using the MADI method allows empirical data about events in the education and training process only to be obtained. However, this data is not enough to fully analyse the education process. It is necessary to complement them for example, on the analysis of verbal and non - verbal expression or on the assessment of direct participation in lessons (pupils) obtained through the method of questioning or interview. The combination of such data could then serve to improve the didactic competencies of future Physical Education teachers.



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