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Student Teachers' Instructional Alignment in Lesson Plans for Teaching Swimming During School Placements

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Abstract: The aim of this study was to investigate student teachers' (STs) instructional alignment in lesson and unit plans for teaching swimming in elementary, middle and high school. Six STs from one Physical Education Teacher Education (PETE) program in Western Europe who were teaching a unit of at least four lessons were included. The unit- and lesson plans were written for teaching elementary-, middle-, and high school students during school placements. An analysis of the quality and alignment between unit goals and lesson learning outcomes, assessments, and instructional tasks was conducted by trained coders. Coder reliability was 100%. The STs wrote a total of 19 unit goals, of which four (21%) included a behavior, situation and criterion. Thirteen out of 19 unit goals were assessed (68%), varying between 33% - 100% between STs. Only nine of 92 (9%) lesson learning outcomes were assessed, varying between 0% - 25% between STs. Instructional alignment between unit goals and assessment was 10% and 6% between lesson learning outcomes and assessment. For planned instructional tasks 27% (n = 83) were aligned with the unit goals and 28% (n = 85) with the lesson learning outcomes. The STs specialized content knowledge was considered poor, only one ST achieved the 3.0 benchmark for strong specialized content knowledge. This study demonstrated a wide variability in results between STs. The STs experienced problems with writing explicit unit goals, developing assessments, and ensuring instructional alignment in lesson and unit plans. Low content knowledge of the STs may have influenced the problems with instructional alignment. PETE programs should focus on teaching instructional alignment as part of content classes and need to hold STs accountable for implementing instructional alignment in planning and teaching.

Keywords: *Unit Goals, Lesson Learning Outcomes, PETE, Assessment, Content Knowledge*

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INTRODUCTION

Student Teachers' Instructional Alignment in Lesson Plans for Teaching Swimming

Imagine two teachers, Ms. Roxy and Mr. Pete, who are teaching an 8-lesson unit of front crawl swimming to middle school students. Ms. Roxy has selected some fun and engaging tasks for students to improve their crawl performance. Halfway through the unit, she realizes she needs to assess students' performance and develops a rubric for the summative assessment. She thinks about worthwhile unit goals that would fit the assessment and the content she has already taught. The lesson prior to the assessment, she explains the criteria for this assessment and provides students with some time to practice. The students are confused and consider it unfair since they are not familiar with the unit goals and the assessment does not reflect what they have been doing over the past lessons.

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Mr. Pete, on the other hand, developed the unit goals as well as the assessment prior to the start of the unit. He shared both the unit goals and the assessment rubric with his students during the first lesson of the crawl unit. Throughout the unit, Mr. Pete selected lesson tasks that allow students to meet the lesson learning outcomes which progressively teach towards achieving the unit goals. He can determine progress towards the unit goals and modify teaching tasks if students are unable to make progress. During the lessons, students are focused on meeting the lesson learning outcomes and unit goals. The above vignette describes a situation in which a teacher utilizes (Mr. Pete) or does not utilize instructional alignment (Ms. Roxy). Instructional alignment is the extent to which objectives, assessments and are aligned (Cohen, 1987).

Instructional Alignment in Physical Education

Instructional alignment is an inherent part of quality education since high degrees of alignment between goals, assessments, and instructional tasks have led to effect sizes of 1.2 to 3 sigma for student performance (Cohen, 1987). In practical terms, a one-sigma effect means that a student moves from the 50th percentile to the 84th percentile thanks to instructional alignment. In 2020, the International Association for Physical Education in Higher Education (AIESEP) published a position statement in which they emphasized the importance of instructional alignment. It was stated that "effective teaching should demonstrate a match between what students are intended to know and be able to do, the opportunities they receive to practice and learn, and how we assess their learning process" (AIESEP, 2020). Although the importance of matching the conditions of instruction to the conditions of assessment for student learning was established decades ago (Carroll, 1963; Cohen, 1987), the available literature in physical education indicates that instructional alignment is something with which student teachers, teachers, and teacher educators struggle (Borghouts et al., 2017; Doutis & Ward, 1999; Iserbyt et al., 2024; James et al., 2008; Lund & Veal, 2008; Redelius et al., 2015). For individual sports (i.e., gymnastics, track and field, dance, swimming, self-defense, parkour, rope skipping), Iserbyt et al., (2024) analyzed the unit and lesson plans of 31 STs from one PETE program. They found that only 61% of all (n = 145) unit goals, and 46% of all lesson learning outcomes (n = 476) were strongly aligned with the assessments. Also, it was found that only half of the instructional tasks (n = 1806) were strongly aligned with unit goals and lesson learning outcomes. The other half represents a substantial loss of learning potential and efficiency. Imagine a medical student learning how to replace a knee joint (unit goal) but instead completing tasks that focus on removing the appendix. Borghouts et al. (2017) in their study with secondary school teachers showed misalignment between what teachers reported to be important physical education goals and what they assessed. Teachers in their study reported

increasing students' fitness as least important, although 81% of those teachers assessed students' fitness (Borghouts et al., 2017).

Goals

Explicit goals include a description of the behavior, the situation in which the behavior needs to be performed and at least one criterion for success (Lund & Veal, 2013; Iserbyt et al., 2024). The behavior describes the activity the teacher expects students to perform, with an indication of at least one performance criterion. Last, the teacher needs to describe the condition in which the behavior needs to be performed. For example: At the end of the unit students will demonstrate the correct technique of aquatic breathing (i.e., exhaling for 2 seconds under water and inhaling for 1 second above water) during 25 meters front crawl swimming. When those three elements are present, the unit goal or lesson learning outcome becomes assessable. Without a criterion, students nor teachers can determine whether the unit goal or learning outcome was met, and without a condition (i.e., 25 meters) it would be impossible to know the circumstances in which the performance should be demonstrated. Finally, unit goals or lesson learning outcomes should be feasible. This means that meeting the unit goals or learning outcome is feasible with regards to the setting (e.g., 28 students in two lanes of a municipal swimming pool), available material (e.g., only five pairs of fins with different sizes), and instructional time (e.g., 30 minutes of time in the water). When a unit goals or learning outcome is not explicit and thus not assessable, it is also not feasible.

Informing students about the expected unit goals, lesson learning outcomes and the assessment criteria at the start of a lesson unit reduces ambiguity of the task and ensures students have a clear picture of the teacher expectations. Students will use this knowledge to improve their performance, and their response rates will be higher, which in turn lead to greater levels of success than when students do not have information at the start of the unit (Lund & Shanklin, 2011; Chng & Lund, 2018). Providing clear and precise expectations for the students at the start of the instructional unit increased the probability that students will be on task during lessons. However, since STs struggle with writing quality unit goals and lesson learning outcomes (Iserbyt et al., 2024; Lund & Veal, 2008), it is uncommon that STs inform their students about their expectations at the start of the instructional unit (Erdmann, et al., 2006; Redelius & Hay 2012; Zhu, 2015). In the study by Lund & Veal (2008), a total of 17 STs wrote 527 lesson learning outcomes. Of those, 20% were not defined as lesson learning outcomes, but rather tasks students needed to complete. Additionally, only 17% of lesson learning outcomes for elementary and 22% of lesson learning outcomes for secondary school were both assessable and feasible (Lund & Veal, 2008). Iserbyt and colleagues

(2024) in their study with 31 STs in individual sports reported that only 9% of unit goals were both assessable and feasible. None of the cognitive unit goals, and only 2% of affective unit goals were feasible. For lesson learning outcomes, results were even lower with 8% of all lesson learning outcomes being assessable and feasible. Like the results of unit goals, affective and cognitive lesson learning outcomes were less assessable and feasible in comparison with motor learning outcomes (Iserbyt et al., 2024).

Assessment

Assessment is defined as a process by which information on student learning is obtained, interpreted, and communicated, relative to one or more predefined lesson learning outcomes (AIESEP, 2020). Data retrieved from assessment is used by teachers to make future decisions about teaching and student learning (Veal, 2000). Since assessment is critical for student learning, it serves as a key aspect of quality teaching in physical education (Penney et al., 2009). However, research shows that assessment quality in physical education is poor (Penney et al., 2009; Thorburn, 2007), and STs often struggle to assess student learning (Anderson, 2002). Assessments regularly include fitness testing and the assessment of isolated technical skills. Further, subjective determination of effort, cooperation in class, and overall management-related aspects of performance (e.g., cooperation, proper attire) are commonly used to determine student grades (Borghouts, et al., 2017; van der Mars et al., 2018; Veal, 1988). Management-related performance expectations (e.g., being on time) should not be linked to unit goals and/or lesson learning outcomes, since they do not increase students' knowledge related to the instructional unit (Matanin & Tannehill, 1994). Teaching and assessment should therefore focus on purposeful learning, which includes setting goals in the psychomotor, cognitive, and affective domain (AIESEP, 2020).

Research showed that STs had difficulty in developing purposeful assessments that match the stated unit goals or lesson learning outcomes (Borghouts, et al., 2017; Penney, 2009; Iserbyt et al., 2024; Thorburn, 2007; Veal, 1988). Iserbyt et al. (2024) found that 33% of 145 unit goals were not assessed. The authors suggested that the incoherent instructional design reflected the inability of STs to hold students accountable for meeting the predetermined unit goals.

Instructional Tasks

What students learn is predominantly determined by the tasks they perform (Hastie & Siedentop, 2006). Research has shown that the number and type of tasks teachers select is a function of their content knowledge (Iserbyt et al., 2020; Kim & Ward, 2020). One of the knowledge domains within

CK is specialized content knowledge (SCK) (Ward, 2009). This is the knowledge a teacher needs to teach the content. It consists of knowledge of how to represent (i.e., demonstrate and describe) CCK to students visually of verbally (i.e., task presentation), instructional task progressions, and knowledge about common errors and corrections. To adapt the instruction to students with different ability levels, a teacher needs strong SCK (Kim et al., 2018; Ward, 2009; 2020).

Tasks selected or planned for the whole class are called inter tasks (Rink, 1979). However, when a task is given for an individual or small group when they cannot perform the original task or the task is too easy, this is an intra task (Dervent et al., 2016; Iserbyt et al., 2020; Ward et al., 2017). Differentiated instruction occurs when a teacher prepared intra tasks for individuals or small groups with high or low skill levels (Tomlinson, 2014). The tasks selected by teachers are impacted by their CK (Iserbyt et al., 2020; 2024b; Ward et al., 2014). Teachers with strong SCK will be able to sequence several tasks progressively until an instructional outcome is achieved, which is called inter task development (Dervent, et al., 2016). Rink (1979) defined four task types to develop content on lesson plans and during lessons. The initial task given in a content progression is called an informing task (I) (e.g., swim 25 meters front crawl using the leg movement with one shoulder pointing to the bottom of the pool). After the informing task a teacher can adjust the difficulty level of the task by implementing an extending task (E) (e.g., rotate every six leg actions from one to the other shoulder). When a task focusses on the quality of a movement, a refining task is given (R) (e.g., make sure to exhale all the air in the water). Last, a task aiming to improve the use of skill or to assess a student's performance, is called an applying task (A) (e.g., swim 50 meters front crawl and count the number of strokes used).

Teachers with high SCK select various extending and refining tasks beyond the informing task, with the aim to improve student learning (Ward et al., 2014). The depth of a teacher's content knowledge is expressed by means of the SCK index. This index is calculated by dividing the sum of extending, refining and applying tasks with the number of informing tasks ($\frac{(E+R+A)}{I}$) (Dervent et al., 2018). An index below the benchmark of 3.0 represents low levels of SCK, which has been associated with poor student learning (Iserbyt et al., 2015; Ward et al., 2017). When a teacher's SCK is higher, content is more developed beyond the informing tasks and student learning is positively impacted (Iserbyt et al., 2015; 2024b; Kim et al., 2018; Ward et al., 2022).

Tasks must be deliberately selected by the teacher and contribute to the achievement of unit goals and lesson learning outcomes. For this, high levels of SCK are needed. Iserbyt et al. (2024), indicated that from a total of the 1806 tasks STs planned in their lesson plans, only half were aligned

with unit goals and lesson learning outcomes. The authors argued that a lack of SCK hindered STs selection of developmentally appropriate and aligned tasks.

Study Purpose

The purpose of this study was to investigate the instructional alignment in STs lesson plans for teaching swimming during their school placements. Specifically, three research questions were addressed in this study: (a) What was the quality of unit goals and were the assessments aligned with the unit goals? (b) What was the quality of the lesson learning outcomes and were the assessments aligned with the lesson learning outcomes? (c) What was the STs specialized content knowledge index and were the instructional tasks aligned with unit goals and lesson learning outcomes? Despite the limited availability of previous research, the hypotheses for this study were that the instructional alignment between unit goals, lesson learning outcomes, assessment, and instructional tasks would be poor.

This study systematically replicated previous research in that lesson plans of STs were examined for instructional alignment. It extends previous work because it reported STs data separately, which allowed us to investigate the differences and similarities between STs. In addition, swimming was the content domain in this study which is different from other studies on instructional alignment. Because of its importance as a lifetime physical activity (SHAPE America, 2024) and its positive impact on health (LEN, 2024), swimming is a mandatory subject in the physical education programs in the region in which the current study was conducted.

METHOD

Participants and Context

For this study six STs (3 female, 3 male) from one Physical Education Teacher Education (PETE) program in Western Europe were selected. All STs who taught a unit of at least four lessons in swimming during their elementary or high school placements were selected. Before starting the PETE program, all students had completed a 180-credit-hour undergraduate program in movement sciences (bachelor). During this program, students completed content courses in (a) individual sports: swimming, gymnastics, and track and field (12 credits); (b) invasion games including basketball, handball, and soccer (8 credits); (c) net games such as volleyball (2 credits); and rhythmic activities and dance (6 credits). The objective of these courses was to improve the technical and, where applicable, tactical performance in sports. During swimming classes students

increased their Common Content Knowledge (CCK) by performing four strokes: front crawl, backstroke, breaststroke, and butterfly. Starts and turns were included in this course. There was no focus on SCK, in that students in these classes did not learn to teach swimming. In total, approximately 105 to 126 hours were spent on swimming instruction during the undergraduate program.

After completing this undergraduate program, students entered the PETE (master) program of 60-credit hours to become certified physical education teachers. The STs in this study were enrolled in the PETE program. The PETE curriculum contained content -and methods classes with peer teaching (12 credits) and school placements (18 credits). STs took general learning and instruction courses (12 credits) and elective courses (12 credits). Finally, all STs in the PETE program also conducted a research project (6 credits). An obligatory two-hour teaching methods course in physical education (without the focus on swimming) for writing lesson learning outcomes and unit goals was completed by all STs before starting their school placements. The course was instructed by the last author of this paper, an expert in instructional alignment. This content was new and had not been taught in previous coursework in the undergraduate program. During this course STs learned how to write quality unit and lesson plans consisting of unit goals, lesson learning outcomes, assessments and instructional tasks. The STs were taught what explicit unit goals and lesson learning outcomes include (i.e., a behavior, situation and criterion) and why they are important. They learned to develop assessments aligned with their stated goals. During the lesson, STs worked in pairs and practiced writing explicit goals for different content domains. These were then discussed in class and possible difficulties for writing explicit goals were presented. STs were instructed to implement instructional alignment in their lesson planning using the backward mapping strategy (Wiggins & McTighe, 2005), where they must start with writing unit goals, followed by developing an assessment to assess whether the students met the stated goals. Last, they need to sequence instructional tasks to help students meet the goals. During the lesson the backward mapping strategy was explained and then practiced in groups of two and discussed in class. A distinction was made between planned tasks for the whole class (i.e., inter tasks) and planned tasks for smaller groups or one student (i.e., intra tasks). The distinction between these tasks was made on the lesson plan to prompt students to plan inter- as well as intra tasks. There was no assessment of STs understanding and skills regarding instructional alignment upon completion of the lesson.

Unit and Lesson Plans

A template designed by the university was offered to the STs for preparing all unit and lesson plans. The template can be found in the supplementary materials. In the unit plans, STs had to write the unit goals. No requirements regarding the planning of the three types of unit goals (motor, cognitive, and affective) was provided on the template. STs wrote down the assessments for the unit goals. The STs chose whether and how many unit goals they wrote for each of the three learning domains. Lesson learning outcomes for each lesson were developed/written (motor, cognitive, and affective outcomes) as well as the assessment for these lesson learning outcomes. The PETE program's lesson template was developed to prompt STs to sequence instructional tasks progressively (see supplementary material). All 33 lesson plans were written for teaching swimming lessons in middle, high and elementary school. In total, one unit and five lesson plans were written for elementary school and 28 lesson plans across five units for high school. Also, in this case there were no requirements to have a certain number of lesson learning outcomes from a specific learning domain.

An online portfolio from the PETE program's university was used to upload unit plans before the school placement started. Lesson plans were uploaded one day prior to the start of the lesson. The university supervisor could access this portfolio to review unit- and lesson plans. This method is not unique for this study and is done by all STs in this PETE program for all school placements. There was no standardized protocol for providing feedback by both the university supervisor and the cooperating teacher in school. Even though the cooperating teacher was asked to provide feedback, there was no follow-up from the university nor were the cooperating teachers held accountable for this task. Since all STs did their school placements in different settings with different cooperating teachers and different PETE faculty as supervisors, types and amount of feedback likely varied between STs. Lesson plans were not updated based on the feedback given following a lesson.

Dependent Variables and Coding Protocol

Using the worksheets from previous studies (Iserbyt et al., 2024; Lund & Veal, 2008), a coding protocol was designed. Development of this protocol started by all coders coding unit- and lesson individually. During a meeting, all differences were discussed and a draft for the coding protocol for this study was developed. Six experts in sport pedagogy validated the protocol by taking into account two questions: (a) does this protocol allow for the analysis of instructional alignment; and

(b) does this protocol contain redundant or missing variables for accurately analyzing instructional alignment? Comments and suggestions were taken into consideration and final adjustments to the coding protocol were made.

All dependent variables were retrieved from the STs unit and lesson plans. Instructional tasks were retrieved from the lesson plans. Each planned instructional task was coded as either an inter- or intra task (i.e., whole-class task or a task for individuals or groups of students, respectively). Content development was coded using Rink's (1979) method of categorization. Content development includes the selection and implementation instructional tasks to meet a specific instructional outcome (Dervent et al., 2016). The first task of a lesson or an instructional progression was coded as an informing task (I). When a task focused on improving the quality of a skill, it was coded as a refining task (R). A task that was made more difficult or easier was coded as an extension task (E). An applying task (A) was coded when the focus was on the use of a skill in a different context or when the task served to assess the performance of the skill. Last, a repetition of a previous task with the same criterion, was coded as a restating task (RT). The SCK-index was used to measure the SCK of the STs, using the formula: $SCK - index = \frac{(E+R+A)}{I}$. All inter tasks were used in this formula (Rink, 1979).

Motor, cognitive, and affective unit goals and lesson learning outcomes were distinguished in the coding process. Each unit goal and lesson learning outcome was coded as explicit or partial. When a goal contained a specific behavior (e.g., students swim breaststroke), an indication of the condition (e.g., 2 lengths of 25 meters), and one or more criteria (e.g., streamline with ears in between arms), the goal was coded as explicit. A goal was coded as partial when at least one of these three components was missing. When a lesson learning outcome was copied across more than one lesson plan, it was coded as a repeated learning outcome. An analysis of whether the instructional tasks contributed to achieving the written unit goals was completed to determine the alignment of instructional tasks with the unit goals. The same was done for the alignment of instructional tasks with the lesson learning outcomes In the coding protocol, an instructional task was coded as (a) strong (i.e., criteria, behavior, and condition were aligned with the unit goals or lesson learning outcomes), (b) weak (i.e., behavior, condition or criteria were not aligned), or (c) no alignment (i.e., none of the three components were aligned with the unit goals or lesson learning outcomes). Tasks were also coded as to whether they contributed to the unit goal. In the coding protocol, "aligned with" in the case of instructional tasks referred to "contributed to the unit goals or lesson learning outcomes." For example, a task that involved breaststroke in a front crawl unit

was coded as 'not aligned'. For the assessment, instructional alignment with unit goals or lesson learning outcomes was coded as strong, weak, or not aligned. Strong alignment was determined when the behavior, situation and criteria in the unit goals or lesson learning outcomes matched those in the assessment. When one or two components (i.e., criteria and/or situation) were not associated, weak alignment was coded. A task was coded as not aligned when none of the three components (i.e., behavior, situation, criterion) were aligned. When one or two of the three components were aligned, a weak alignment was coded (see the Supplementary Material for the full coding protocol).

Coder Training and Reliability

The coders were trained by following the Content Development Coding Assessment Manual (Dervent et al., 2016). This manual contained two steps with three assessments in between. In the first step definitions about content development (i.e., instructional tasks) were studied. In the third step, learned definitions for content development were presented in different contexts with the aim of providing practical application examples. In the final task of the training protocol task types on lesson plans for different context were coded (Dervent et al., 2016). Knowledge and understanding were checked with a quiz after each step. A perfect score (100%) for each assessment was required before continuing to the next step. For the final assessment a 95% agreement or higher with a trained coder when coding task types from lesson plans (Dervent et al., 2016).

An instructional alignment manual was developed by the last author of this study. The coding manual was developed based on the worksheet from Lund & Veal (2008) and its adaptation for the study by Iserbyt et al. (2024). This manual contained definitions, descriptions, and examples for all dependent variables. After the coders studied both manuals, an in-person meeting was conducted to evaluate knowledge and understanding of the manuals. During this meeting the coders collected data from a unit and four lesson plans together to calibrate their coding and to avoid coding differences. Two trained coders coded the unit and lesson plans of all STs independently after which they met to assess disagreements. This process was supervised by the last author of this study, an expert in instructional alignment. The disagreements were discussed and resolved. The full coding protocol is available upon request with the first author.

Data Collection, Coding and Analysis

An online learning platform, including a portfolio was used to collect all unit plans, lesson plans and assessment forms conducted by the STs. For this study, all units for swimming with a minimum

of four lessons were included. All data were collected and coded by the first author of this study. The third author of this study checked 100% of the data and disagreements were discussed until maximum agreement was reached. Data in this study were reported in absolute numbers and percentages. Data for each ST were reported individually to allow for assessing individual differences that could be masked when aggregating data. The implementation of teaching was not observed.

RESULTS

Unit plans from six STs from one PETE program in Western Europe were included in this study. The sample evaluated six unit plans for swimming lessons, one for elementary school and five for secondary school. All units consisted of at least four lessons (range 4-8 lessons). In total, 19 unit goals were written. In total 33 lesson plans (range 4–8 lesson plans per ST) were included consisting of 92 lesson learning outcomes (range 8-31 per unit) and a total of 303 planned instructional tasks (range 27-73 per unit).

Unit Goals and Assessment

Combined, STs taught six swimming units and stated 19 unit goals (range 2-5 unit goals per ST). Results of explicitness, assessment, and alignment can be found in Table 1.

Table 1. Overview of the Explicit (E) and Partial (P) Motor -, Cognitive -, and Affective Unit Goals per ST and Whether These Were Assessed, Aligned with Assessment, and Reflected in Instructional Tasks (Planned)

	Motor Goals				**Cognitive Goals**				**Affective Goals**			
ST	N (E-P)	Assessed	Aligned	Planned Instructional Tasks	N (E-P)	Assessed	Aligned	Planned Instructional Tasks	N (E-P)	Assessed	Aligned	Planned Instructional Tasks
1	2-2	4	3	3	0-0	NA	NA	NA	0-1	0	0	0
2	0-4	2	0	3	0-0	NA	NA	NA	0-0	NA	NA	NA
3	0-2	2	0	2	0-0	NA	NA	NA	0-0	NA	NA	NA
4	0-1	1	0	1	0-1	1	0	1	0-0	NA	NA	NA
5	2-0	2	2	2	0-1	0	0	1	0-0	NA	NA	NA
6	0-2	2	0	1	0-0	NA	NA	NA	0-1	0	0	0
Total (%)	4-11	13	5	12	0-2	1	0	2	0-2	0	0	0
%		87	33	80		50	0	100		0	0	0
Mean	0.7-1.8	2.2	0.8	2	0-0.3	1.2		0.3	0-0.3			

**Data may not add up due to rounding*
NA = Not Applicable

All six STs wrote at least one motor goal. Only two STs wrote a cognitive or affective goal. Four STs failed to write at least one explicit goal and not one ST wrote only explicit unit goals. Only STs 3 and 4 attempted assessing the unit goals. However, for both STs, their assessments had a weak alignment with the unit goal. Overall, the proportion of assessments demonstrating alignment with the unit goals ranged from 0% (ST 2, 3, 4 and 6) to 100% (ST 5).

Table 2. Overview of the Explicit (E), Partial (P), and Repeated (R) Motor-, Cognitive-, and Affective Lesson Learning Outcomes per ST and Whether These Were Assessed, Aligned with Learning Outcomes (LO) and Unit Goals (UG) and Taught To in Instructional Tasks

	Motor Learning Outcomes					**Cognitive Learning Outcomes**					**Affective Learning Outcomes**				
ST	N (E-P-R)	Assessed	Aligned LO	Aligned UG	Planned Tasks	N (E-P-R)	Assessed	Aligned LO	Aligned UG	Planned Tasks	N (E-P-R)	Assessed	Aligned LO	Aligned UG	Planned Tasks
1	2-3-7	3	3	3	6	0-0-0	NA	NA	NA	NA	0-1-4	0	0	0	0
2	0-0-0	NA	NA	NA	NA	0-1-7	0	0	0	0	0-1-7	0	0	0	0
3	0-4-4	2	0	0	8	0-0-0	NA	NA	NA	NA	0-0-0	NA	NA	NA	NA
4	0-6-10	1	0	0	16	0-3-12	0	0	0	3	0-0-0	NA	NA	NA	NA
5	3-3-0	2	0	2	5	0-2-1	0	0	0	0	0-0-0	NA	NA	NA	NA
6	0-4-4	1	0	0	3	0-1-0	0	0	0	0	0-2-0	0	0	0	0
Total	5-20-25	9	3	5	38	0-7-20	0	0	0	3	0-4-11	0	0	0	0
%		18	6	10	76		0	0	0	11		0	0	0	0
Mean	0.8-3.3- 4.2	1.5	0.5	0.8	6.3	0-1.2-3.3				0.5	0-6.7-1.8				

**Data may not add up due to rounding*
NA = Not Applicable

STs planned a total of 303 tasks with 262 inter tasks (range 25-72 per ST) and 41 intra tasks (range 1-15 intra tasks per ST). Less than half of the planned tasks were explicit, and the proportion of explicit tasks varied between 12% and 65%. STs total planned tasks, inter -and intra tasks, explicit tasks, alignment with lesson learning outcomes & unit goals, and SCK Index are represented in table 3.

Task types varied in absolute and relative numbers for STs resulting in SCK-indexes ranging between 0.9 (ST 2) and 4 (ST 5). There was one ST (ST 5) who met the benchmark of 3.0 for strong SCK. Alignment of planned instructional tasks with lesson learning outcomes was 28% (n = 85) and with unit goals 27% (n = 83).

Of all unit goals, 79% were reflected in the planned instructional tasks (range 33%-100%). For motor unit goals, 80% were presented in the planned instructional tasks) However, no affective

unit goals were represented by planned instructional tasks in the lesson plans. Of all unit goals, 74% were reflected in the planned instructional tasks. Of all lesson learning outcomes, 45% were presented in the planned instructional tasks. Only ST 4 planned instructional tasks for the cognitive learning outcome. Only three STs (ST 1, 2 and 6) wrote an affective learning outcome. None of those were reflected in the planned instructional tasks (0%).

Table 3. Student Teachers' Total Planned Tasks, Inter -and Intra Tasks, Explicit Tasks, alignment with learning outcomes & unit goals, and SCK Index

	ST 1	**ST 2**	**ST 3**	**ST 4**	**ST 5**	**ST 6**	**Total**	**Mean**
Unit duration (n lessons)	5	8	5	6	5	4	33	5.5
Total Tasks	55	73	40	70	38	27	303	50.5
Mean tasks per lesson	11	9.1	8	11.7	7.6	6.8	54.2	9
Range total tasks	5-14	4-16	4-12	4-19	5-11	3-13		
Strong alignment with unit goals (%)	23 (42)	0 (0)	27 (66)	21 (30)	14 (37)	0 (0)	85 (28)	14.2
Strong alignment with learning outcomes (%)	23(42)	10 (14)	27 (66)	0 (0)	23 (61)	0 (0)	83 (27)	13.8
Total Inter tasks	49	72	25	60	30	26	262	60.3
Mean Inter tasks per lesson	9.8	9	5	10	6	6.5	46.3	7.7
Range total inter tasks	4-13	4-16	4-7	3-19	4-8	2-13		
Explicit tasks (%)	14 (29)	14 (19)	3 (12)	39 (65)	17 (57)	11 (42)	98 (27)	16.3
Informing tasks (%)	10 (20)	11 (15)	11 (44)	15 (25)	6 (20)	11 (42)	64 (25)	10.7
Extending tasks (%)	2 (4)	20 (28)	8 (32)	19 (32)	9 (30)	5 (19)	63 (24)	10.5
Refining Tasks (%)	13 (27)	2 (3)	0 (0)	11 (18)	6 (20)	5 (19)	37 (14)	6.2
Applying Tasks (%)	7 (14)	7 (10)	2 (8)	9 (15)	7 (23)	4 (15)	36 (14)	6
Repeated Tasks (%)	17 (35)	32 (44)	4 (16)	6 (10)	2 (6)	1 (4)	62 (24)	10.3
SCK-Index	2.9	2.6	0.9	2.6	4	1.3		3.2
Total Intra tasks	6	1	15	10	8	1	41	6.8
Mean Intra tasks per lesson	1.2	0.1	3	1.7	1.6	0.3	7.9	1.3
Range total intra tasks	1-2	0-1	0-6	0-8	0-4	0-4		

**Data may not add up due to rounding*
NA = Not Applicable

DISCUSSION

Unit Goals and Lesson Learning Outcomes

The current study found that all STs struggled to write explicit unit goals and the majority of unit goals were not explicit. This finding was consistent with Iserbyt et al. (2024) and Lund & Veal (2008). This lack of explicit unit goals creates problems with assessment, task selection, and instructional alignment. Although the STs in this study had a class on writing explicit goals, they have not yet mastered this skill. The class in which they received information about instructional alignment was generic to physical education content and not related to teaching swimming. Although speculative, we believe that teaching instructional alignment theoretically as a generic skill might be suboptimal as opposed to teaching it when it is embedded in a content knowledge course, for example in swimming. Multiple studies from different countries have already reported a lack of content knowledge in both pre- and in-service teachers (Dervent et al., 2020; Farias et al., 2022; Iserbyt & Coolkens, 2020; Iserbyt et al., 2024; Kim & Ward, 2020), which affects their selection of tasks (Kim & Ward, 2020). Consequently, the two-hour lesson during methods class might have helped STs on how to use instructional alignment, but without the necessary content knowledge in swimming they were not able to operationalize goals and lesson learning outcomes, and thus design appropriate assessments and select relevant appropriate tasks.

No ST wrote explicit cognitive or explicit affective unit goals and two STs did not write any cognitive or affective unit goals, all of which is in line with previous research (Iserbyt et al., 2024; Lund & Veal, 2008). The lesson and unit plan templates included prompts for writing cognitive and affective unit goals and lesson learning outcomes, which are part of the local physical education standards. These prompts can promote instructional alignment. It is possible that STs are not familiar with what students are able to do and need to know in these domains or how to teach and assess this. Although the emphasis of physical education is on the psychomotor domain (Lund & van der Mars, 2022), PETE programs should invest time in helping STs to write, teach, and assess cognitive and affective unit goals and lesson learning outcomes.

The findings of this study also raise the question about how these STs are being supervised by their cooperating teachers in schools and the PETE faculty. Each STs in this study had a different cooperating teacher or PETE faculty. There was no control over the quantity or quality of the feedback given by the cooperating teacher. Quality feedback was expected from the PETE faculty. Neither the cooperating teacher nor the PETE faculty were held accountable for giving feedback.

We have no data on whether and how the feedback procedure occurred and whether the feedback was aligned with the learning outcome. The university program should place greater importance on the alignment of feedback, lesson learning outcomes, and content with training the cooperating teacher and the PETE faculty as a way to encourage accountability. Future research could provide professional development to increase quality of supervision regarding instructional alignment between unit goals, lesson learning outcomes, assessments and instructional tasks by the cooperating teacher. The PETE program should inform both cooperating teacher and PETE faculty about the importance of instructional alignment and hold them accountable for giving high quality feedback.

Also, the cooperating teachers in this study can select the content that the STs teach based on their curriculum and available facilities. The authors of this study have observed that often cooperating teachers select content domains for STs in which they themselves have limited content knowledge or experience. Consequently, this also affects the quality of their feedback on content to the ST. This is an area that warrants further investigation.

All six STs repeated lesson learning outcomes across different lessons which means that the lesson learning outcomes were exactly the same across different lesson plans. Those repeated learning outcomes confirm previous work from John (2006), who reported that STs find writing lesson plans to be a time-consuming task. Together with a low level of accountability for achieving lesson learning outcomes, repeated learning outcomes across lessons could be a form of studentship, where STs write them down only to comply with university expectations (Graber, 1991). The low number of explicit unit goals together with the large proportion of repetition of learning outcomes suggest that STs had difficulty in defining a precise outcome for their instruction and thus were unable to create lessons that made incremental progress towards the unit goal. To use a metaphor: if you are travelling by car and you are not sure about your destination, then how can you determine which road to use? The principle of backward mapping (Wiggins & McTighe, 2005) might be helpful in avoiding the issue of repeated learning outcomes. In backward mapping, the STs can plan backward from the final lesson (e.g., lesson six) to lesson one by means of intermediary learning outcomes. A terminal outcome is needed as a starting point for the backward mapping strategy. Backward mapping ensures that teaching occurs in a progressive way and avoids repeating learning outcomes since conceptually, having the same outcome across lessons violates the idea that teaching implies a progression from easy (in the beginning of the unit) to complex (towards the end of the unit). Results show that STs were not able to correctly apply the backward mapping strategy, which raises questions about the quality of the methods class STs in this study received.

Results showed that explicit unit goals and lesson learning outcomes were more likely to have instructional tasks to meet these goals and outcomes. All explicit unit goals were represented by instructional tasks that allowed them to be met. For partial unit goals, this was found only 55% of the time. In other words, if it is clear where you want to go your itinerary will get you to your destination and often allow you to do so more expediently. Explicit unit goals and lesson learning outcomes facilitate the selection of appropriate tasks, the development of assessments, and the alignment between these components (Iserbyt et al., 2024). This is shown in ST 5's lesson plans, which had the most explicit unit goals and lesson learning outcomes and utilized these unit goals and lesson learning outcomes in instructional tasks. Conversely, ST 6 had no explicit unit goals and lesson learning outcomes with very few instructional tasks devoted to learning of that content. Teaching STs to write explicit goals in PETE programs is recommended and future studies could investigate its effect on students meeting the unit goals.

Assessment and Instructional Alignment

Without assessment, instruction is like trying to hit a target with a blindfold on. Indeed, teachers cannot know whether students have met the instructional outcomes if no assessments are being conducted and thus cannot make decisions regarding future instruction (AIESEP, 2020). Additionally, assessment provides learning targets for students and ensures accountability for learning (Lund & Shanklin, 2011). Communicating the form of assessment at the start of a lesson unit ensures that students better understand the goals and how they will be held accountable, which leads to higher on-task behavior and improved student learning (Lund & Shanklin, 2011; Chng & Lund, 2018). Despite all the advantages of assessing students, STs in this study assessed 10% of all lesson learning outcomes with a range from 0% (ST 2) to 25% (ST 3). There were large differences between STs. Only STs 3 and 4 assessed all their unit goals (i.e., three unit goals). This low number of assessments showed that that STs did not hold students accountable for meeting lesson learning outcomes. In general, teachers often lack enthusiasm for and familiarity with assessment, with many perceiving the assessment process as time-consuming and overly unnecessary. However, some cooperating teachers may recognize the importance of assessment and hold STs accountable for administering them. Although speculative, these differences in attitudes and accountability among cooperating teachers could potentially influence the outcomes of STs. Future research could explore these differences in depth to better understand impact of differences in quality assessment on evaluation effectiveness and related results.

In this study STs assessed a total of 14 unit goals and nine lesson learning outcomes, which is a proportion of 74% and 10% respectively. The data show few assessments were planned, and alignment of these assessments with the unit goals and lesson learning outcomes was very low. Five of 14 assessed unit goals were aligned. For lesson learning outcomes three of nine assessments were aligned with the lesson learning outcomes and three with the unit goals. Only ST 1 and ST 5 developed assessments for unit goals that were aligned with the unit goal. Also, for the assessment of lesson learning outcomes, only ST 1 and 5 were able to align their assessments with a stated goal and a learning outcome. Previous studies had similar results (Borghouts et al., 2017; Iserbyt et al., 2024), showing that the difficulties STs face regarding assessment and instructional alignment in physical education are not isolated and require urgent action from PETE programs.

Content Knowledge and Instructional tasks

Physical Education Teacher Education (PETE) programs have a critical role in the preparation of quality physical education teachers. Content Knowledge (CK) was found to be limited in physical education teachers which affects their task selection, task progression, and student performance (Dervent et al., 2020; Iserbyt & Coolkens, 2020). Research has indicated that teachers select more appropriate tasks and modify tasks to match a student's ability level after following a content knowledge workshop (Iserbyt et al., 2020; 2024). Although the evidence is limited, the authors speculate that instructional alignment is affected by teachers' content knowledge.

Only one (ST 5) of six STs succeeded in achieving the 3.0 benchmark for strong SCK, with a SCK index of four, which is in line with previous research (Iserbyt et al., 2024; Dervent et al., 2020; Farias et al., 2022; Kim & Ward, 2020). Although no causal effect nor correlation can be established, we speculate that CK influences the quality of the selected instructional tasks and the alignment with assessments, as well as the entire instructional alignment process. However, there is a need for future experimental research that can determine the effect of CK on instructional alignment.

Limitations and Strengths

External validity of this study is low, since the study was conducted within one PETE program in Western Europe. However, results confirm the lack of instructional alignment as documented in previous research (Borghouts et al., 2017; Iserbyt et al., 2024). The low number of STs included in this study limit generalization to the whole population or other universities but allowed for investigating differences between STs who are enrolled in the same PETE program and who are

teaching the same content domain (i.e., swimming) during their school placements. Those limitations lower the external validity of this study. More replication studies in different regions, universities, and content domains to validate the results presented in this work. Additionally, this study only used unit and lesson plans without observations. Future work could invest time to observe the implementation of the unit- and lesson plans during their school placements. Additionally, this study did not investigate the alignment between planned instructional tasks and assessments. Future work could study this topic.

A strength of this study is that we replicated previous work on STs instructional alignment in lesson and unit plans in a different content domain, namely swimming. High-quality swimming education plays a critical role in promoting lifelong physical activity and offers benefits for both mental and physical health (CDC, 2024). In the United States 3 out of 4 parents think swimming is a lifetime skill (YMCA, 2024). There are programs developed by swimming experts which STs could use to state specific unit goals and lesson learning outcomes and select content (The American Red Cross, 2024; YMCA, 2024). Together with previous studies in swimming (Iserbyt et al., 2024), this study demonstrated that swimming education in schools might be poor. Therefore, PETE programs should invest time in improving content knowledge for teaching swimming in schools, including the implementation of instructional alignment.

Unlike previous studies in instructional alignment, this study reported data from individual STs instead of aggregated data, which allows for exploring the variability between STs. The study was conducted using data from an intact PETE program, therefore, the ecological validity of this study was high. Additionally, this study was among the first to connect instructional alignment with content knowledge.

CONCLUSION

The instructional alignment in all six ST for teaching swimming in schools was poor. Results show that STs struggled to write explicit unit goals and lesson learning outcomes that included a behavior, situation and criterion. Additionally, few unit goals and lesson learning outcomes were assessed. Assessments were not aligned with the written unit goals and lesson learning outcomes. The methods class that students received did not lead to STs developing strong instructional alignment unit and lesson plans. The low content knowledge of the STs in swimming might have contributed to the poor results in this study.

We recommend PETE programs to evaluate their curriculum and explicitly implement instructional alignment in their courses. Based on these findings, we also argue that instructional alignment cannot be taught devoid of content. Instructional alignment should be embedded in content knowledge courses and evaluated for understanding. The PETE faculty and program should also hold STs accountable for implementing instructional alignment during methods classes and school placements. One way of doing this is by integrating the use of instructional alignment in the assessment of STs. Lastly, PETE faculty must connect with the cooperating teachers to ensure that they are knowledgeable in instructional alignment and hold STs accountable for implementing instructional alignment.

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