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Within-year changes of lesson structure: an exploration of pedagogical functions of lessons by means of multilevel growth curve modelling in Indonesia

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Teaching is undoubtedly complex and the complexity of classroom practice implies that the structure of lessons making up teaching may differ and subject to change over time. The aims of this study were to investigate changes in observed lesson structure, and explore the effects of several teacher and contextual characteristics on differences in lesson structure during the first year of secondary education in Indonesia. Fifteen mathematics and English as Foreign Language teachers teaching 32 classes were videotaped four times (32×4) across the entire school year. A coding protocol to assess lesson structure focusing on the pedagogical functions of lessons was used. Six lesson components characterizing the general structure of the lessons were observed: introduction, review, introducing new content, student work time, closing and other. Multilevel growth curve modelling was used. Results revealed the six elements of lesson structure to be present, with student work time as the most frequent element. Relatively large class differences in lesson structure were visible. Evidence for changes over time in the components of lesson structure was evident as well. Teaching subject, class type and teaching experience explained differences in lesson structure. This study provides a global discussion about what matters in teaching from the perspective of lesson structure.

Keywords: classroom practice; lesson structure; video-based study; longitudinal study; multilevel growth curve modelling

Introduction

Research shows that supportive classroom practices are important predictors of student learning and outcomes (e.g. Maulana, Opdenakker, den Brok, & Bosker 2011; Opdenakker & Maulana, 2011; Opdenakker & Minnaert, 2011; Seidel & Shavelson, 2007; Wubbels & Brekelmans, 2005). There are numerous studies suggesting the importance of several elements of classroom practices, based on students' and/or teachers' *perceptions* of behaviours, such as interpersonal relationships (e.g. den Brok, Brekelmans, & Wubbels, 2004; Opdenakker, Maulana, & den Brok, 2012; Wubbels & Brekelmans, 2005); instructional components, such as clarity, classroom management and distribution of control (e.g. den Brok, Bergen, & Brekelmans,

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2006; Opdenakker & van Damme, 2007); display of pedagogical content knowledge components (e.g. Berry, Loughran, & van Driel, 2008); or socio-emotional components, such as involvement, autonomy support and competence encouragement (e.g. Maulana et al., 2013; Opdenakker & Maulana, 2010a; Skinner et al., 2008).

However, the structural element of teaching has hardly ever been researched. Although the literature on teaching effectiveness recognizes lesson structure (LS), which refers to how teachers organize their lessons to facilitate students' learning, as an element of effective teaching (Creemers, 1994; Scheerens & Creemers, 1996), the knowledge on lesson structure is still underrepresented. Additionally, it remains unclear whether or not lesson structure can be conceived of as a stable component that is not subject to change over time. At the same time, studies involving classroom *observations* are relatively scarce (e.g. Malmberg, Hagger, Burn, Mutton, & Colls, 2010). Since a meta-analysis of Seidel and Shavelson (2007) revealed that variables measured via video observation produced larger effect sizes in relation to student outcomes than variables measured via self-reports, incorporating video studies in studying teaching has, therefore, high potential for understanding actual teaching behaviours and classroom interactions (Miller & Zhou, 2007; Stigler, Gallimore, & Hiebert, 2000). Moreover, most classroom studies have focused on either primary or upper secondary education, while much fewer studies have focused on the lower secondary education years or the middle school period (Maulana et al., 2010). The fact that students experience a new start with important changes in educational environment is an important reason to investigate teaching practices in the lower secondary education context (Maulana et al., 2012).

The present study aimed to contribute to the knowledge base about classroom practice in a number of ways. Firstly, classes of teachers were followed *longitudinally* during the first year of secondary education. Secondly, we documented teaching practices through *videoed* lessons. Finally, *multilevel growth curve modelling* enabled us to tackle the hierarchical structure of our data, paying attention to the variability and change of LS as well as differences in LS over time. Importantly, this research could shed light more on how teachers use LS across time and the consequence of their practices for student learning. Such findings are important for teacher educators and school leaders in the effort to improve the quality of teaching by paying more attention to the structure of the lesson.

Structure as an integral part of classroom practice

The quality of classroom practice depends on the way the teacher organizes classroom activities (Scheerens & Bosker, 1997; Scheerens & Creemers, 1996). One particular element which is important in every classroom practice is structure (Skinner & Belmont, 1993; Maulana et al., 2012). The conceptualization of structure by different research traditions varies widely. In motivational theories, such as the self-determination theory, structure refers to teachers' provision of clear expectations, consistent behaviour and help for students (Opdenakker & Maulana, 2010a; Skinner et al., 2008). The classroom management literature recognizes structure in terms of teacher behaviour aimed at creating order (Doyle, 1986), communicating procedures (Emmer, Evertson, & Anderson, 1980), providing guidelines about how to complete certain tasks (Carter & Doyle, 2006) and lessening misconduct while encouraging academic engagement (Brophy, 2006). In teacher interpersonal behaviour studies, structure is conceived of as teacher leadership and helpfulness (Wubbels &

Brekelmans, 2005), while in instructional behaviour studies, structure refers to clarity of instruction and rule clarity exhibited by teachers (den Brok et al., 2006).

The teacher effectiveness literature considers structure as one of the most important dimensions of classroom practice (Kyriakides, Creemers, & Antoniou, 2009). Presenting teaching material in a structured way is expected to maximize the learning outcomes. Other strategies to promote structure are starting the lesson by giving an overview or review of objectives, outlining content, signalling the transitions between lesson parts, calling attention to main ideas and reviewing these at the end of the lesson (Brophy & Good, 1986). Structure is likely to influence the kind of activities and learning experiences that students might have (Brophy, 1999). Lesson structure emphasizes the importance of teachers' ability to manage and organize the lessons in such a way that they maximize the academic engagement level (Creemers & Reezigt, 1996).

Lesson structure

Structure has often been studied in terms of the organization of lessons, also named lesson structure, and originates from the work of Herbart. The literature shows considerable variations in terminology with regard to lesson structure, such as lesson script (Stigler & Hiebert, 1999), lesson pattern (Stigler et al., 2000), lesson signatures (Hiebert et al., 2003) and teaching scripts (Givvin, Hiebert, Jacobs, Hollingsworth, & Gallimore, 2005), to name a few.

Herbart cited in Dunkel (1969) argued that knowledge acquisition consists of formal stages that are linked together by association, and in order for learning to occur, these formal stages need to be completed. Herbart's formal stages of learning include: (1) constructing cognitive clarity of previously learned material, (2) stimulating elements of new knowledge by relating them to knowledge already learned, (3) systematizing these associations and (4) applying the new knowledge. His postulation is well known as a cyclical sequence of learning steps, which further shaped classroom practice considerably in the USA and Europe (Savola, 2008). Opposite to Herbart's structured lesson idea is an intuitive instructional approach, which promotes a more spontaneous teaching practice (Oser & Baeriswyl, 2001).

Investigations of lesson structure have gained considerable attention across the world, perhaps in part due to the emergence of utilizing video-based studies in classroom contexts. Good examples of these are the Third International Mathematics and Science Study (TIMSS) and the Learner's Perspective Studies (LPS) video studies (Hiebert et al., 2003; Stigler et al., 2000). Drawing from single, randomly selected math lessons that covered a broad range of topics, the 1995 and 1999 LPS video studies indicated a high stability of (math) instruction (Hiebert et al., 2003). They assumed that national teaching patterns represent stable practices as well as culturally shared beliefs about good classroom practice (Hiebert et al., 2003; Seidel & Prenzel, 2006). However, research suggests that a remarkable variability within a country and across the lesson activities as regards structure is evident, suggesting that classroom teaching patterns can vary over the course of lessons (cited in Seidel & Prenzel, 2006).

Pedagogical functions of lesson structure

The subject-related didactic literature recognizes three dimensions of observable LS. Those are (1) *function*, e.g. the pedagogical functions of lesson components, (2)

form, e.g. the forms of social interaction and (3) *task structure*, e.g. the structures of tasks shaping the instructional practice (Savola, 2008). Furthermore, analyses of LS can be conducted at the ‘whole lesson’, ‘topic’ and ‘lesson event’ basis (Clarke et al., 2008). In this study, we focus on the investigation of the function dimension of LS at the whole lesson level. Specific attention is paid to the proportion of time devoted to components of the lesson. It is important to investigate the length of components of LS because it is a basic ingredient for learning. Time devoted to each component of LS is closely related to students’ opportunities to learn and efficient use of time for instruction (Hiebert et al., 2003). The amount of learning time appears as a significant predictor for the effectiveness of teaching (Karweit, 1989; Rosenshine & Berliner, 1978). In relation to this, reviewing, introduction of new content and student work time give students the opportunity to come into contact with new learning material and content; give them the opportunity to work themselves with the content and material (Brophy & Good, 1986; Shuell, 1996); and are related to student academic engagement (Maulana et al., 2012). Reviewing can be seen as a means to enhance the activation of prior knowledge of students, which is important for the facilitation of their learning (e.g. Brophy & Good, 1986; Shuell, 1996; Rinehart & Welker, 1992). Thus, paying attention to devoting ample time to those lesson components is important. Specifically, executing an appropriate pace is essential, as it helps in maintaining momentum and retaining the students’ attention as well as enables the teacher to cover more content (Case, 1993).

Variables affecting classroom practice

Past research indicates that some personal and contextual characteristics may affect differences with regard to teaching practices. Amongst others, Opdenakker and Van Damme (2001) discovered that high ability classes reported a more favourable classroom practice than other class types. Moreover, Opdenakker and Maulana (2010a, 2010b) found that high ability classes perceived higher teachers’ structure support compared with mixed ability classes. There is some evidence that classroom climates of math and science classes are less favourable than that of other school subjects (den Brok, Taconis, & Fisher, 2010; Telli, 2006).

Opdenakker and Van Damme (2007) reported that male teachers’ classroom organization was more favourable over females’ classroom organization, while Martin and Yin (1997) demonstrated that male teachers are more controlling compared to their female colleagues. Regarding teaching experience, research suggests that the level of controlling behaviour tends to increase as teachers become more experienced, while the level of friendliness tends to decrease when teaching experience increases (Brekelmans, 2010; Wubbels & Brekelmans, 1998). However, the amount research investigating the effect of contextual characteristics on LS per se is rather limited.

Research questions

Deriving from the previous work on LS reviewed earlier, the following research questions are addressed:

- (1) What is the picture of Indonesian lesson structure, in terms of lesson components, across the school year?
- (2) Does lesson structure vary between classes and over time measurements?

- (3) How does lesson structure change across the school year?
- (4) Are there differences between classes as regards change over time?
- (5) How do teacher and contextual factors like teaching experience, gender, teaching subject, class type and lesson duration relate to lesson structure over time?

Methods

Sample and procedure

The data were drawn from a longitudinal study, tracking 15 Indonesian mathematics and English as Foreign Language (EFL) teachers during their teaching in the first grade of secondary education. Schools in the west part of Indonesia were approached and were recruited based upon voluntary participation. A total of 32 classes were included in the study. Of the 15 teachers, three were male and 12 were female; there were nine math and six EFL teachers. Two of the math teachers were male and seven were female; one of the EFL teachers was male and five were female. The majority of the teachers (81%) were experienced teachers (more than five years of teaching experience). Class size varied between 27 and 34 students.

The lessons were all videotaped two waves during the first semester and two waves during the last semester. Observed lessons had a duration of 30–60 min. The lessons were analysed with the LS observation scheme focusing on the pedagogical functions of the lesson. A total of 128 lessons (four lessons per class), which were selected randomly from the available sufficient quality recordings, were included in the analysis.

Measures

Observed lesson structure

To investigate the pedagogical functions of LS, an observation instrument developed earlier was used (Maulana et al., 2012). In fact, this observation instrument was derived from the purpose-variable of the TIMSS 1999 Video Study (Hiebert et al., 2003). The focus is on the proportion (in terms of the presence and duration) of time spent for each lesson component. The observation instrument assesses the pedagogical functions of LS in terms of the following lesson components: (1) introduction, (2) review, (3) introducing new content, (4) student work time, (5) closing and (6) other. Each lesson component is followed by indicators representing teachers' behaviours related to the lesson component. Examples of behaviours are: introduction ('Displaying verbal/non-verbal signs to draw attention that the lesson is about to start'), review ('Conducting oral surveys about previous lesson'), introducing new content ('Explaining main goals of learning new content'), student work time ('Walking around the class to check and help students complete the task'), closing ('Concluding the lesson and giving homework') and other ('Correcting students who misbehave').¹

Introduction refers to all activities occurring during the start of a lesson that are not related to the content of a lesson. The content is specified as concept(s) that will be discussed, practiced or applied after the introduction component. The main aim of this component is preparing students to get ready for learning. Examples of teacher behaviour during this component include greeting students, checking absence

and announcing class rules. *Review* involves all activities during which classes discuss material/topic of the previous lesson. The main objective of this component is to reinforce, check, assess or re-teach material covered in the previous lesson. Typical activities are discussing content covered in a previous lesson, delivering a pre-test and discussing homework. *Introducing new content* points to a lesson component when new content is introduced. The teacher (or students) brings and explores a new idea, procedure or introduces new problems that have not been discussed in the previous lesson. Some examples of this component include explaining the main goal structure of learning new content, providing examples covered in new content and introducing a major task of a lesson. *Student work time* indicates activities during which students are working on problems/material using the content and procedures presented that day. During this lesson component, students are applying new procedures or practising new materials. Three possible teacher involvement behaviours were observed during this component including helping individual students or groups (i.e. checking individual/group work frequently), helping class instead of individual students (i.e. asking class to solve a task problem on the board) and no contact during student work time (i.e. checking exams while students are busy working). *Closing* is defined as lesson component during which the main activities are finished and the lesson is nearly ended. Closing a lesson can be done in a formal (i.e. summarizing the lesson, planning the next lesson, giving homework), an informal (i.e. closing by the bell; as soon as the bell rings, the lesson is over), or a combination between formal and informal ways (i.e. after closing the lesson, the teacher announces additional homework). *Other* refers to all activities that are out of the lesson content but occurring during the lesson. Some observed situations that belong to this component include disruptions, classroom management and public social talks.

The reliability and validity of the coding scheme has been established in previous research (Maulana et al., 2012). In this study, these psychometric issues were also checked. Prior to establishing the reliability, a coder training was conducted. Two coders independently coded four selected videoed lessons. The resultant coded lessons were compared subsequently. The few differences related to timing were discussed and resolved via a joint observation of the video data. The coders agreed on all four coded lessons at above satisfactory level: inter-rater reliability ranged from .71 to .83, intraclass correlations representing absolute agreement between raters ranged from .87 to .93.

Personal and contextual characteristics

We investigated effects of teachers' personal and contextual characteristics including gender (male vs. female), teaching experience (experienced vs. inexperienced), teaching subject (EFL vs. math), class type (homogeneous classes vs. mixed ability classes) and lesson duration (30 vs. 60 min classes). Descriptive statistics can be seen in Table 1.

Analytic strategy

To examine the first research question, we transformed the raw scores of time unit and converted the scores (range 0–10).² Next, we performed descriptive analyses for each lesson component across the measurement occasions. To answer the remaining

Table 1. Correlations between observed lesson structure, personal and contextual characteristics ($N = 128$).

	1	2	3	4	5	6	7	8	9	10	M	SD
1 Introduction	–										.33	.35
2 Review	.05	–									1.77	3.12
3 Intro. new content	.13	–.39**	–								2.08	2.41
4 Student work time	–.25**	–.70**	–.35**	–							5.39	3.13
5 Closing	–.10	–.02	–.05	–.05	–						.27	.40
6 Other	.11	–.13	–.14	.11	–.12	–					.15	.41
7 Subject ^a	–.02	.02	–.28**	.15	.10	.20*	–				.50	.50
8 Experience ^b	–.01	–.42**	.17*	.28**	–.06	.15	–.16	–			.81	.39
9 Class type ^c	–.25**	–.29**	.14	.24**	.05	–.13	.00	.48**	–		.50	.50
10 Gender ^d	.18*	.18*	.11	–.31**	.14	.00	–.11	–.16	–.11	–	.90	.29
11 Lesson duration ^e	–.15	–.22*	–.06	.25**	–.09	.29**	–.02	.42**	.20*	–.13	.55	.50

* $p < .5$; ** $p < .01$.

^asubject was coded 0 = mathematics, 1 = EFL.

^bteaching experience was coded 0 = 5 years or less, 1 = more than 5 years.

^cClass type was coded 0 = homogeneous, 1 = heterogeneous.

^dgender was coded 0 = male and 1 = female.

^elesson duration was coded 0 = 30 min and 1 = 60 min).

four research questions, we performed multilevel growth curve modelling (MGCM; Rasbash, Charlton, Browne, Healy & Cameron, 2005). MGCM is an appropriate strategy to handle the hierarchical structure of our data (i.e. lessons nested within measurement occasions, nested within classes). Two-level MGCM models for change with class (level 2) and measurement occasion (level 1) were performed. The following models were tested: an empty model to examine the distribution of variance between levels (model 0), time-fixed model to assess the change in lesson structure over time (model 1), time-random model to examine between-class differences in change over time (model 2) and covariate models to evaluate effects of several personal and contextual characteristics on lesson structure (model 4). Predictors with $p < .10$ were retained as statistically significant.³

Results

General picture of lesson structure

Figure 1 illustrates the distribution of class time across lesson components over time. The results show that student work time appeared to be the most prevalent component of lesson structure (54%). Introducing new content appeared to be the second-most prevalent component (21%), followed by review (18%), introduction (3%), closing (3%) and other (2%).

Additional analyses showed that Indonesian teachers spent about 71% of the time during this lesson component communicating with class as a whole. Merely 23% of the time was allocated for interacting with individual (groups or subgroups) student, and about 6% with having no contact with students at all (see Figure 2).

Variability of lesson structure

We found around 12–40% of the variance at class level (see Table 2). The most between-class variations are found for introducing new content and student work

Figure 1. General time distribution of Indonesian lessons components across the school year.

Figure 2. General time distribution of Indonesian student work-time component across the school year.

Table 2. Distribution of the total variance of lesson structure over the class and occasion level (percentages).

	Introduction (%)	Review (%)	Intro. new content (%)	Student work time (%)	Closing (%)	Other (%)
Class level	31.3	38	40	40	11.6	19.7
Occasion level	68.7	62	60	60	88.4	80.3

time (40%), followed by review (38%), introduction (31%), other (20%) and closing (12%). We only found 12% of between-class variations for closing, meaning that there were relatively fewer differences between classes as regards the distribution of time spent for closing the lesson compared to the other five components of lesson structure. We found more variability over time (60–88%) than between-class variability. In general, the results suggested there was evidence for between-class variations in lesson structure, but the variation over time was more pronounced than variation between classes.

Change in lesson structure over time

The effects of time on all lesson components was significant, except for student work time and ‘other’ components (Model 1, Tables 3–8). There was evidence for a systematic increase in time allocated to introduction ($\beta = .02$, $p < .05$) and review ($\beta = .10$, $p < .10$) over time, while time spent on closing seemed to decrease systematically over time ($\beta = -.02$, $p < .05$). In addition, we found a curvilinear

change (a change with systematic increase/decrease together with de- or acceleration) in time devoted to introducing new content ($\beta_{\text{time}} = 2.26$, $\beta_{\text{time}}^2 = -.41$, $\beta_{\text{time}}^3 = .02$, $p < .10$), suggesting that the amount of time spent on introducing new content decreased during the first months and continued to increase during the subsequent months with (small) de- and acceleration over time.

Class differences in change over time

We found significant differences regarding the linear effect of time for introduction, review, introducing new content, student work time and other ($ps < .05$), but not for closing ($p = .27$). The predicted value plots of class differences in change over time show quite disperse patterns for all components of LS (see Model 2, Tables 3–8).

Effects of personal and contextual characteristics

Several personal and contextual factors affected lesson structure (Model 3, Tables 3–8). Teachers in heterogeneous classes spent less time on introduction than teachers in homogeneous classes ($p < .05$). Female teachers spent more time on introduction than male teachers ($p < .10$). Furthermore, teaching experience could explain differences in review, suggesting that experienced teachers spent less time on review than inexperienced teachers ($p < .01$). As regards introducing new content, the results suggest that EFL teachers allocated less time to introducing new content than their math colleagues ($p < .05$). Teacher experience and gender could explain differences in student work time as well. The results indicated that experienced teachers spent more time on this lesson component than inexperienced teachers ($p < .05$). In addition, female teachers allocated less time to student work time than male teachers ($p < .05$).

Teaching subject, class type, teaching experience and lesson type could explain differences in the component ‘other’. The results show that EFL teachers allocated more time to this component than math teachers ($p < .05$). Similarly, experienced teachers spent more time on dealing with disruptions and classroom management than inexperienced teachers ($p < .10$). Moreover, disruptions and classroom management were more visible in longer lessons than in short lessons ($p < .001$). Finally, teachers in heterogeneous classes allocated less time to managing classrooms and disruptions than their colleagues in homogeneous classes ($p < .01$).

Conclusions and discussion

Concerning the first research question dealing with the general picture in lesson structure, our observed classroom practices revealed all six lesson components to be present, including introduction of the lesson, review, introducing new content, student work time, closing the lesson and other (i.e. disruptions and classroom management). Of all six lesson components, we found that student work time was the most prevalent component characterizing lessons, followed by introducing new content, review, introduction, closing and other. It is clear that in general, teachers in Indonesia allocated most of their lessons working together with their students. This finding is consistent with the pattern found in other countries (Hiebert et al., 2003; Maulana et al., 2012; Najvar, Najvarova, & Janik, 2009; Roth et al., 2006). We found that teachers used most of the time during student work episodes for lecturing in front of

the class (whole class teaching) than for assisting individual students. The former is recognized in the literature as closely related to a direct instruction or teacher-centred approach. Our finding is consistent with previous research indicating that most Indonesian teachers tend to use a conventional lecturing method. This method has been criticized as a traditional way of teaching which facilitates passive students' participation (Eisuke et al., 2006; Kaluge, Setiasih, & Tjahyono, 2004). Still, teacher–individual student interaction in Indonesian classrooms is hardly present, because teachers tend to teach and interact with the whole class instead of with individual students (Zulkardi & Nieveen, 2001).

Although teachers have been given more autonomy to apply a more student-centred teaching method, many teachers do not take the opportunity to implement a more personalized teaching practice. Instead, many teachers interpret the autonomy as requiring additional workload (Bjork, 2003). This reason could probably explain why many teachers pay (too) little attention to individual student (student-centred) and devoted insufficient time (for student group work) during their teaching (Chiriac & Granstrom, 2012).

Between-class and over time variations in LS are evident. This indicates that classes, on average, do differ as regards pedagogical functions of LS and that LS is not stable over time. Although reasons for these differences remain unclear, perhaps teacher adaptation to students and lesson content, to some extent, may explain these findings. Additionally, topic differences may also influence the way teachers organize and structure their lessons. Teachers may use different instructional activities to adjust to various topics (Seidel & Prenzel, 2006). Indeed, we also observed in our videoed classes that even within the same lesson activity and topic (i.e. introducing new content of geometry), some teachers exhibit inquiry-based instruction by bringing students' own questions to learning, while others use lecturing-based instruction by presenting and explaining the material on the blackboard. If within the same topic of the same lesson, activity teachers vary in their use of teaching methods, it is therefore not surprising that class differences in LS are evident. Another line of reasoning is that the curriculum setup and/or lesson materials (books and methods) may determine LS as well. If particular books or teaching methods are used, the variability is actually desired. Previous research suggested that teachers are expected to maintain the balance of each LS component in their teaching practice rather than increasing one component and ignoring the other to increase student academic engagement (Maulana et al., 2012).

Changes in the time devoted to components of LS are also visible. We found a systematic increase in introduction and review, and a curvilinear (increasing and decreasing) change in introducing new content over time. In addition, closing shows a systematic decrease over time. The educational effectiveness literature recognizes the importance of review, introducing new content, informing parts of lesson transition and discussing ideas at the end of the lesson for student performance (Brophy & Good, 1986; Rosenshine & Stevens, 1986). Time management is argued as an essential part of LS determining the facilitation of students' opportunities to learn (Creemers & Kyriakides, 2008). The more students have the opportunity to learn, the more they academically engage in learning (Emmer et al., 1980). Particularly, the importance of allocating sufficient time for review, introducing new content and SWT for student academic engagement is highlighted (Maulana et al., 2012). Moreover, reviewing facilitates the activation of prior knowledge of students, which is important for the facilitation of their learning as mentioned by the literature on the

Table 3. Multilevel models of introduction.

	Model 0		Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>								
Intercept	.327***	.044	.230***	.069	.230**	.074	.026	.173
Time			.016*	.008	.016	.013	.014	.013
Time ²								
Subject							.046	.072
Class type							-.172*	.079
Experience							.133	.109
Gender							.209°	.122
Lesson type							-.043	.061
<i>Random effects</i>								
Level 2 variance (class)								
Intercept	.040	.016	.041	.016	.146	.045	.148	.045
Intercept × time					-.023	.007	-.024	.008
Time					.005	.001	.005	.001
Level 1 variance (occasion)								
Residual	.088	.012	.085	.012	.024	.004	.024	.004
Δ -2Loglikelihood			3.301*		59.751*		7.221*	

° $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4. Multilevel models of review.

	Model 0		Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>								
Intercept	1.772***	.402	1.155*	.592	1.155*	.536	2.698*	1.386
Time			.099°	.071	.099	.084	.084	.086
Time ²								
Subject							.296	.596
Class type							-.527	.662
Experience							-2.504**	.916
Gender							1.105	1.014
Lesson type							-.545	.595
<i>Random effects</i>								
Level 2 variance (class)								
Intercept	3.676	1.313	3.706	1.312	3.087	2.535	1.363	2.127
Intercept × Time					-.245	.344	-.261	.325
Time					.102	.061	.105	.061
Level 1 variance (occasion)								
Residual	6.010	.868	5.891	.850	4.640	.820	4.578	.809
Δ-2Loglikelihood			1.925		8.449*		17.319*	

° $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5. Multilevel models of introducing new content.

	Model 0		Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>								
Intercept	2.077***	.315	-.901	1.726	-.901	1.442	-1.504	1.854
Time			2.258*	1.160	2.259*	.996	2.171*	.966
Time ²			-.409°	.219	-.409*	.181	-.398*	.181
Time ³			.021°	.012	.021*	.010	.020*	.009
Subject							-1.704*	.806
Class type							.494	.594
Experience							.266	.812
Gender							.962	.909
Lesson type							.276	.478
Time × Subject							.075	.135
<i>Random effects</i>								
Level 2 variance (class)								
Intercept	2.303	.802	2.370	.800	3.136	1.583	2.190	1.348
Intercept × Time					-.300	.212	-.277	.199
Time					.083	.037	.086	.037
Level 1 variance (occasion)								
Residual	3.462	.450	3.197	.461	2.182	.386	2.147	.380
Δ -2Loglikelihood			7.657*		12.292*		9.467*	

° $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 6. Multilevel models of student work time (SWT).

	Model 0		Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>								
Intercept	5.391***	.409	5.367***	.601	5.367***	.498	5.136***	1.421
Time			.004	.070	.004	.082	.012	.080
Time ²								
Subject							.672	.619
Class type							.393	.688
Experience							2.049*	.946
Gender							-2.405*	1.053
Lesson type							.294	.594
<i>Random effects</i>								
Level 2 variance (class)								
Intercept	3.898	1.356	3.898	1.356	1.565	2.280	.000	.000
Intercept × Time					-.046	.312	.000	.000
Time					.081	.058	.064	.022
Level 1 variance (occasion)								
Residual	5.841	.843	5.840	.843	4.849	.857	4.841	.699
Δ -2Loglikelihood			.004		9.103*		16.112*	

* $p < .10$; * $p < .05$; *** $p < .01$; **** $p < .001$.

Table 7. Multilevel models of closing.

	Model 0		Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>								
Intercept	.269***	.042	.407***	.080	.407***	.086	.189	.194
Time			-.022*	.011	-.022*	.011	-.025*	.012
Time ²								
Subject							.105	.079
Class type							.085	.088
Experience							.004	.123
Gender							.207	.135
Lesson type							-.094	.080
<i>Random effects</i>								
Level 2 variance (class)								
Intercept	.019	.015	.021	.014	.067	.066	.070	.067
Intercept × Time					-.006	.008	-.006	.008
Time					.001	.001	.001	.001
Level 1 variance (occasion)								
Residual	.144	.021	.138	.020	.129	.023	.129	.023
Δ -2Loglikelihood			4.055*		.599		5.799*	

* $p < .10$; ** $p < .05$; *** $p < .001$.

Table 8. Multilevel models of other (classroom management and disruptions).

	Model 0		Model 1		Model 2		Model 3	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>								
Intercept	.150**	.046	.140°	.082	.140	.115	-.329°	.191
Time			.002	.011	.002	.016	.009	.015
Time ²								
Subject							.189**	.070
Class type							-.217**	.079
Experience							.204 °	.111
Gender							.138	.121
Lesson type							.266***	.072
<i>Random effects</i>								
Level 2 variance (class)								
Intercept	.034	.018	.034	.018	.337	.106	.311	.098
Intercept × Time					-.042	.014	-.040	.013
Time					.006	.002	.006	.002
Level 1 variance (occasion)								
Residual	.138	.019	.138	.019	.064	.011	.059	.010
Δ -2Loglikelihood			.021		26.890*		25.147*	

° $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

importance of rehearsal and advance organizers (e.g. Brophy & Good, 1986; Rinehart & Welker, 1992). Nevertheless, in constructivist learning environments, the amount of guidance and the explicitness of structure decrease over time, as it is expected that students gradually take over responsibility from the teacher.

As far as changes in the time allocated for these components over time are concerned, Indonesian teachers seem to be going in a good direction by paying attention to maintaining the time devoted to introducing new content and review. However, it should be noted that it is not just paying ample attention to those mentioned components that makes a difference; it is the balance of maintaining lesson activities that is more important, because structuring elements of the lesson facilitates memorizing of the information and stimulates its apprehension as an integrated whole (Case, 1993), leading to enhanced student outcomes (Opdenakker & Maulana, 2010a; Skinner, 1991).

Class differences in LS change are also evident. This suggests that classes do differ in their trajectories of allocating time to LS components over time. Class differences in the change of LS over time suggest that some classes show favourable trajectories, while others need to pay more attention to LS. Favourable classes as regards the allocation of time for LS over time do exist. Therefore, this video study can be used as a tool for teachers and teacher educators to stimulate discussion amongst them concerning favourable LS for enhancing student academic engagement. One way to implement this is via the teacher professional community agenda (Sweeney, 2010) or by integrating LS in a theme of teacher education training.

Several personal and contextual characteristics could explain differences in LS. Teaching subject seems to play a role in the introducing new content and other components. EFL teachers spent less time introducing new content, but they spent more time on dealing with disruptions and classroom management than their colleagues teaching mathematics. Our findings support the literature regarding the role of teaching subject in classroom practice (e.g. den Brok et al., 2010; Telli, 2006). The role of class type is also visible, but its effect seemed to appear only in the introduction and other components, suggesting that teachers in heterogeneous classes spent less time on introduction and managing classrooms and disruptions. These findings are in line with the literature on class type effect on learning environments (e.g. Lapointe, Legault, & Batiste, 2005; Opdenakker & Maulana, 2010a).

The effect of teacher experience is visible for review, student work time and other components, indicating that experienced teachers allocated less time to review, but they devoted more time to student work time and managing classrooms and disruptions than inexperienced teachers. Concerning student work time, past research indicated that inexperienced teachers seem to have problems when interacting with the class as a whole compared to experienced teachers (Wubbels & Brekelmans, 2005). Perhaps this is because inexperienced teachers are often confronted with a lack of behavioural repertoire and insufficient knowledge and skills in this area. Furthermore, research on teacher–student interpersonal relationships reveals that inexperienced teachers tend to have uncertain/tolerant and tolerant styles, and frequently meet situations inadvertently allowing students to initiate misbehaviour (Brekelmans, Wubbels, & den Brok, 2002). This may justify why inexperienced teachers allocated less time to the management of classroom disruptions. However, research also recognized that experienced teachers tend to concentrate on daily routines and are less flexible to deviate from these routines compared to inexperienced teachers. This phenomenon is considered as ‘concentration of experience’

(Van Buul, 2008). Our finding, together with findings from previous research mentioned earlier, suggests that strengths and weaknesses in classroom practice can be found in both experienced and inexperienced teachers. As Ulvik and Langorgen (2012) suggested, both experienced and inexperienced teachers can learn from each other to improve teaching practice. This can be done, for instance, by learning via the videotaped lessons on several effective strategies how experienced teachers deal with student work time and classroom management, and how inexperienced teachers exhibit strategies for an effective review during the lesson. Moreover, teacher gender affects differences in introduction and student work time, showing that female teachers spent more time on introduction, but they allocated less time to student work time than their male colleagues (see also Martin & Yin, 1997; Opdenakker & Van Damme, 2007). Finally, lesson type could explain differences in the other component. As expected, disruptions and events related to classroom management are more visible in longer lessons than in shorter lessons. Taken together, our results suggest that differences in classroom practice may be influenced by several personal and contextual factors. Thus, future research on classroom practice should take these factors into account.

Implications, limitations and future directions

This article contributes to the body of knowledge about classroom teaching practice in terms of differences and changes in LS. The fact that classes differ in the allocation of time devoted to lesson activities (over time) implies that some classes are more favourable than the others with regard to maintaining a productive LS. This provides a global discussion about what matters in teaching. Specifically, although this study provides no clue regarding the influence of LS on student outcomes, previous research recognizes that paying attention to review, introduction of new content and student work time are important for student academic engagement (Creemers & Kyriakides, 2008; Maulana et al., 2012). Therefore, knowledge-sharing between teachers as regards strategies to maintain good LS seems to be promising as far as maintaining academic engagement is concerned. Moreover, the fact that LS is, on average, not stable over time implies that classroom teaching is subject to change over time. This change can be due to adaptation to lesson topics (Seidel & Prenzel, 2006) or adjustment to students over time.

Furthermore, our results suggest that (Indonesian) teachers teaching heterogeneous classes and mathematics and male teachers could spend more time on introduction, because during this activity students can be stimulated to get ready for learning certain tasks. Experienced teachers could spend more time reviewing the lesson because when information is presented with the degree of redundancy, students' performance tend to be optimized (Leinhardt, Weidman, & Hammond, 1987). Additionally, disruptions and events related to classroom management occurred more frequently in longer than in shorter lessons and in experienced than inexperienced teacher classes. This implies that (Indonesian) teachers teaching in longer lessons and experienced teachers should develop various teaching strategies aiming at keeping students on tasks and maintaining their interest in learning consistently. Adopting a more active teaching strategy and constructivist-oriented lessons might be beneficial for student outcomes (Widodo, 2004).

The fact that several personal and contextual factors affect differences in LS implies that variability in LS exists. Hence, future research on the stability of

teaching patterns should take into account these variables. Finally, the TIMSS video study investigated classroom teaching in Germany, Japan and the USA, and found variability in instructional patterns amongst those countries. Our study provides additional insight from an Indonesian perspective that may be useful for further international comparisons in classroom practice. By exploring the way, a high-achieving country, such as Japan and the Netherlands, organize their lessons taking into account both quantitative as well as qualitative characteristics of LS together offers a potential benefit for Indonesia and other low-achieving countries in general. Future research would benefit from comparative studies on LS including multiple countries.

Although our study is promising, it is not fully conclusive. One limitation is that we mainly focus on the sight structure of LS (Seidel & Prenzel, 2006) without incorporating more qualitative aspects of it. We are aware of the fact that not only the quantitative aspects matters, but that the quality aspects of LS are also important. Hence, future research should attempt to combine the investigation of surface and more micro-levels in order to deepen our understanding of teaching that support productive learning, as recognized by the teacher effectiveness literature (Creemers & Kyriakides, 2008). Additionally, constructing a country profile (or cluster analysis on LS) may also be useful to facilitate effective interventions for classes with less favourable lesson structure. Finally, although the sample size of the present study is relatively large, it contains samples from the west part of Indonesia only. Therefore, generalizations beyond this context should be taken with care until replications in broader contexts are available.

Nevertheless, this study offers a starting point to go beyond the observable classroom organization. It opens the possibility to focus the investigation further on the quality of classroom teaching practice situated on a deeper level of teaching and learning processes and link them with various student outcomes. It is our expectation that, from the perspective of LS, this study will offer an opportunity for the further investigation and discussion of the complex nature of classroom practice internationally.

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Notes

1. The complete instrument can be obtained from the first author.
2. Proportion score was computed as follows: Time of each lesson component/total lesson duration $\times$ 10. The possible range of scores for each lesson component was set to range between 0 and 10.
3. Due to a relatively small number of teacher sample, a 10% significant level was retained to increase the statistical power (Snijders & Bosker, 1999).

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