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# One-time pedagogical events to teach academics instructional models and the effect on students' perceptions of teaching effectiveness

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**Abstract**

Different types of pedagogical programs for academics are implemented worldwide. Out of these types, one-time pedagogical events were presented as having a medium effect size when aiming to develop academics' pedagogical skills. Also, the academics' ability to organize the course was strongly associated whit students' achievement. In this study, we investigated whether using instructional models as training content in one-time pedagogical events aiming to improve academics' ability to organize the course, could improve their teaching behavior as perceived by their students. Three instructional models (*Gagné's instructional model,* an adapted version of *Gagné's instructional model*, and *Engelmann's Direct instructional model*) were taught in three one-time events, and we used the academics' current practice as a baseline for comparisons. Twelve academics involved in one-time pedagogical events used their new skills in 47 classes and were evaluated by 1226 students. As compared with the academics' current practices, learning instructional models by attending one-time pedagogical events led to improved evaluations from their students. These effects were moderated by class size and students' academic year.

**Keywords:**

higher education, instructional development programs, instructional models, students' perceptions of teaching effectiveness.

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## 1. Introduction

Attention to teaching practices in higher education has grown due to the necessity to sustain students' active learning and achievement. Universities from many countries (e.g., the UK, Sweden, or the Netherlands) have opted for compulsory pedagogical training of academics (e.g., Sonesson and Lindberg Sand 2006) and have also set up different institutional structures (centers or units) to provide instructional development programs (IDPs) for academics (Jacob et al. 2015). The European Commission (2016) has highlighted the strategic importance of improving the quality of teaching in higher education through sustaining academics to adopt the student-centred learning paradigm which is one of the priority areas of the Bologna Process (Hoidn and Reusser 2020).

All over the world, different models of IDPs for academics have been implemented (Amundsen and Wilson 2012). Among these models, one-time pedagogical events are a particular type of IDP (De Rijdt et al. 2013). Traditionally, one-time pedagogical events were perceived as having a low efficacy level (Stes et al. 2010). Recently, a meta-analysis on IDPs for academics (Ilie et al. 2020) suggested that one-time events could have a medium size effect (d = 0.571). Ilie and his collaborators (2020) reported that one-time events are effective, especially when the intervention aims to increase participants' pedagogical skills. Organizing the course seems to be an essential pedagogical skill for academics to promote student-centred teaching and learning activities. Schneider and Preckel (2017) highlighted that this university teachers' capacity is strongly associated with student achievement (d = 1.39).

In this study, we argue that using instructional models (IMs) in one-time pedagogical events to improve academics' ability to organize the course could have a positive effect on students' perceptions of teaching effectiveness. *Gagné's IM* (Gagné and Briggs 1974), *Gagné's Adapted IM* (Ilie 2014), and *Engelmann's Direct IM* (Engelmann 1980) were taught in three one-time IDPs. The effect on students' perceptions of teaching effectiveness of using these IMs in practice by medical academics was compared with the effectiveness of academics' current practice. Additionally, we considered the possible effect of class size and students' year of the study.

## 2. Instructional models as training content in IDPs

IMs are step-by-step procedures that allow the lesson to be structured as a series of instructional events. The IMs are rooted in behavioral psychology and evolved in response to new information about the learner and learning (Magliaro et al. 2005). IMs could be effective tools for organizing and structuring instruction during a course. For example, Hattie (2009) reported that the usage of the seven steps of direct instruction, outlined by Adams and Engelmann (1996) had a medium effect size (d = 0.59) on students' achievement. Moreover, the effect of direct instruction varies from medium to large depending on different groups of students (Hattie 2009).

The IMs are used in various areas (e.g., teacher education – Krull et al. 2010; military training – Spector 2000; or higher education - Hampton and Reiser 2004). Out of these models, *Gagné's IM* (Gagné and Briggs 1974) is one of the best-known, most influential, and most used IM (Smith and Ragan 2000). For example, in the context of teachers' professional development, Krull and his collaborators (2010) successfully used the nine events of *Gagné's IM* (Gagné and Briggs, 1974) to promote the student teachers' lesson analysis skills. Other studies showed the utility of using various adaptation versions of *Gagné's IM* in higher education. Hampton and Reiser (2004) used an approach derived from *Gagné's IM* (i.e., *Reiser and Dick's IM*, 1996) to provide pedagogical training to teaching assistants. The authors reported a significant impact of the training on students' perceptions of

teaching effectiveness. Also, after observing university teaching activities, Ilie (2014) highlighted that the usage of *Gagné's Adapted IM* (Ilie 2014) has a significant impact on SPTE. Despite such evidence, the interest in using IMs is different from field to field. On the one hand, the interest in using these models is always high in areas such as industry, business, and the military (Reiser 2001). On the other hand, there is little interest in public schools, and there is even less interest in higher education (Reiser 2001). University teachers 'do not consciously think of their work as *design*, nor do they articulate or conceptualize what they do in design terms' (Bennett et al. 2017, 142). Furthermore, Noben, Deinum, and Hofman (2020) reported that 8,9% of academics observed in the classroom obtained an excellent score when clear and structured instruction was used as a criterion of teaching effectiveness. Therefore, the quality of the academics' instructional approach in higher education could be enhanced by including IMs into IDPs dedicated to academics.

## 3. Impact of one-time IDPs on students' perceptions of teaching effectiveness

The length of the pedagogical interventions was considered a feature that could influence the final impact of the IDPs (Stes et al. 2010). Generally, the following dichotomy has been used: *one-time events* vs. *extended overtime interventions*. It should be mentioned that there were divergences between different authors when they defined one-time events. For example, De Rijdt et al. (2013) described one-time events as interventions varying from one hour to two consecutive days. Also, Stes et al. (2010) included in this category events ranging in duration from one hour to four days, while Steinert et al. (2016) included interventions ranging from one hour to six days. The present paper defines one-time IDPs the events lasting between one hour and two consecutive days.

Studies that evaluated the impact of IDPs operationalized teaching effectiveness using concepts such as *change within teachers*, *institutional impact*, and *change within students* (Stes et al. 2010). However, defining the nature and concrete procedures to measure the effectiveness of such training initiatives is highly demanding (Jones et al. 2017). Thus, research studies focused mainly on the changes among teachers (Steinert et al. 2016), while students' ratings are rarely included in this kind of study (Steinert et al. 2016). Therefore, there is a clear need to add new evidence regarding the change in students' perceptions of teaching effectiveness as an outcome of one-time IDPs. Such a research topic could be of interest because students' perceptions of teaching effectiveness is frequently used for assessing teaching quality in universities. Even if students' perceptions of teaching effectiveness is not necessarily related to students' learning (Uttl et al. 2017), it is a relevant method for formative evaluation of teachers' classroom behavior, especially when it is based on robust behavioral rating instruments and it is used together with other indicators of teaching quality (Lohman 2021).

Several review papers, that summarized the research on the effect of IDPs, have been published in the field of instructional development for academics until now (e.g., Ilie et al. 2020; Steinert et al. 2016; Stes et al. 2010). None of these studies addressed the issue of changes in students' perceptions of teaching effectiveness as an outcome of one-time IDPs. Steinert et al. (2016) included students' perceptions of teaching effectiveness in one general category named *Observed change* (together with perceptions of peers, leaders, senior house officers, and teachers). Stes et al. (2010) included seven studies that investigated the impact of IDPs on SPTE, but none presented a one-time event. Ilie et al. (2020) included six studies that showed the effect of one-time interventions on students' perceptions of teaching effectiveness (e.g., Baroffio et al. 2006; Notzer and Abramovitz 2008). However, the authors did not analyze these six studies as one specific category and discussed the two subjects (*one-time events* and *students' perceptions*) only separately. All interventions reviewed by Ilie and

colleagues (2020) have aimed at improving participants' pedagogical skills, were designed based on the assessment of the participants' needs (excepting Notzer and Abramovitz 2008), and were focused on the participants' current teaching practices. For example, Baroffio et al. (2006) planned their three-hour workshops in response to the participants' expressed teaching needs. The workshops also took place during the month preceding the participants' teaching period and aimed to help participants finalize their teaching plans.

## 4. The present study

This study aimed to test the effect of three one-time interventions that use instructional models as content to train medical university teachers. We used ANOVA analysis to investigate the effect of the instructional development programs on students' perceptions of teaching effectiveness and analyze if *class size* and *students' year of study* are associated with these effects. We advanced two research hypotheses:

(*H1*) Students' perceptions of teaching effectiveness *is more positive when teaching activities are taught by teachers using IMs (learned in one-time interventions) than when taught by teachers without using IMs.*

(*H2*) *Class size and/or students' year of study have little or no impact on the* students' perceptions of teaching effectiveness *of activities taught by teachers who use IMs to plan and deliver university teaching activities.*

### 4.1. Participants and procedure

A total of 108 academics from a Romanian medical university enrolled in a mandatory pedagogical program were invited into an initial meeting which aimed to shift the mandatory character of the program toward a partnership model (De Rijdt et al. 2016). An open discussion was held to identify the participants' training needs. Possible learning goals and relevant instructional content were highlighted. Based on this analysis, we selected *Gagné's IM* (Gagné and Briggs 1974), *Gagné's Adapted IM* (Ilie 2014), and *Engelmann's Direct IM* (Engelmann 1980) as the content of three one-time IDPs aiming to improve the academics' capacity to organize their courses. Because these models are well described in the literature, we presented only a short overview of their instructional events in Table 1. These events were also the central concept of the instructional content of our IDPs. For each IM, the lecturer prepared a four-hour training session with the following elements: a) a presentation of the history of the model; b) an explanation of the instructional events; c) an example of how the model can be applied; d) an example of how a lesson plan is designed using the model.

Twenty academics expressed their willingness to participate in the one-time IDPs. Before participating in the training, the academics taught a lesson using their current practice models. Next, the following steps were taken: first, participants received training on *Gagné's IM*; second, they made a lesson plan using *Gagné's IM*; and third, they taught a lesson using their lesson plan. Then, the training, planning, and teaching process was repeated with *Gagné's Adapted IM* and *Engelmann's IM.*

**Table 1.** The instructional events of the three IMs proposed as content in the IDPs

| Gagné's IM (Gagné & Brigges, 1974)* | Gagné's Adapted IM (Ilie, 2014) | Engelmann's IM (Engelmann, 1980)*** |
|---|---|---|

| | | |
|---|---|---|
| Gaining attention | Learning organization** | Introduction of new concept based on previously mastered skills and knowledge |
| Informing the learner of the objective | Gaining attention | Presentation: explanation, demonstration, examples and non-examples |
| Stimulating recall of prerequisite learning | Informing the learner of the objective** | Task and questions for students |
| Presenting the stimulus material | Stimulating recall of prerequisite learning | Feedback from teacher to students |
| Providing learning guidance | Presenting the stimulus material | Independent practice |
| Eliciting the performance | Providing learning guidance | |
| Providing feedback about performance correctness | Eliciting the performance | |
| Assessing the performance | Providing feedback about performance correctness | |
| Enhancing retention and transfer | Assessing the performance | |
| | Enhancing retention and transfer | |
| | Final appreciation** | |

* "order of these events for a lesson or lesson segment is approximate and may vary somewhat depending upon the objective" (Gagné & Brigges, 1974, p135).

** "these events are considered mandatory events in every didactical activity, no matter what the type and the scope of the activity" (Ilie, 2014, p.781).

*** all the events are mandatory in the specific order.

Out of 20 academics, 11 completed their tasks, and another one taught only three lessons, respecting the three steps for each IM (training, planning, and teaching). Another four participants could not complete their tasks in the correct order and were eliminated from the study sample. Also, another four participants dropped out at some point. Thus, we analyzed 47 different activities taught by 12 teachers (of these, 10 females taught 40 classes). Out of these 47, 12 lessons were planned and taught using the *Current Practice Model* of each teacher (attended by 394 students), other 12 used *Gagné's IM* (attended by 330 students), other 12 used *Gagné's Adapted IM* (attended by 270 students) and the remaining 11 used *Engelmann's IM* (attended by 231 students). The academics have different staff grades (one associate professor, two lecturers and nine university assistants) and different teaching experience (from 1 to 15 years, $M$ = 9.58, $SD$ = 3.68). The total number of evaluations by students (between year 1 and 7 of study, $M$ = 2.78, $SD$ = 1.62) that attended the lessons was 1226 (72.7% female).

For each IM, two authors of this paper analyzed all lesson plans independently. Both decided that all the academics' lesson plans respected the instructional events that characterized the IM applied. In the last 10 minutes of each lesson, the academic left the classroom, and a member of the research team asked the students to evaluate the teaching practices based on a questionnaire. Before completing the questionnaire, a member of the research team informed the students about the standard procedure to fill in the questionnaire, that the participation is voluntary, and that all answers are anonymous.

### 4.2. Measures

We used a questionnaire developed from *the Instructional Activities Feedback Form* (Hampton and Reiser 2004) and the instrument proposed by Ilie (2014). The first section of the instrument had five items that identify the students' perceptions of teaching effectiveness using a 5-point Likert scale (i.e., 1 = very little to 5 = very high). A general perception of SPTE was calculated by averaging these five aspects. The internal consistency of the scale was at an optimal level ($\alpha$ = .89). The second section included possible instructional activities. For each of these, students had to report whether: a) the event was included or b) the event was not included in the lesson they just attended. This section aimed to identify if the university teacher followed the lesson plan proposed in teaching the lesson and consequently kept to the IM. The third section collected data about the respondents (i.e., gender, students' year of study, and class size). For the data analysis, we considered the results of the lessons taught using teachers' current practice models as data for the pre-test. We also used the results from the other three situations (*Gagné's*; *Gagné's Adapted* and *Engelmann's*) as data for independent post-tests.

## 5. Results

### 5.1. Preliminary analyses

We examined the research sample data to decide the design of the factorial ANOVA. In two cases, we found fewer than ten subjects (5 and 2, on *First-year students * > 30 students * Gagné's model* and respectively *Adapted Gagné's model*[2]). Consequently, the analysis of three-way interaction was not sustainable (Sava 2011). Next, we investigated whether our data met the assumptions required for conducting factorial analyses of variance (i.e., factorial ANOVAs). We used the Kolmogorov-Smirnov test to check the normality of distribution and Levene's test to check the homogeneity assumption. As our data meted these requirements, we proceeded to the analyses of variance presented below.

### 5.2. Main analyses

The results of the ANOVA 4x2x2 analysis (Table 2) showed that the IDPs had significant effects on SPTE ($F(3,1225) = 4.765$, $p < .01$, $\eta^2 = .012$), *class size* had a small significant effect on SPTE ($F(1,1225) = 11.364$, $p < .01$, $\eta^2 = .009$), while *students' year of study* did not have a significant effect ($F(1,1225) = 1.847$, $p < .174$, $\eta^2 = .002$). Also, the data showed that the interaction between *students' academic year* and *class size* does not have a significant effect on SPTE ($F(1,1225) = .126$, $p < .723$, $\eta^2 = .001$). On the contrary, the combination of *IDPs*students' academic year* and that of *IDPs*class size* had

[2]; such a situation was possible because, at that university, first-year students can attend in advance one or two courses dedicated to non-first-years students. These seven cases are probably in this situation.

significant effects (F(3,1225) = 4.793, $p < .01$, $\eta^2 = .012$ and respectively F(3,1225) = 7.483, $p < .01$, $\eta^2 = .018$).

**Table 2.** Factorial ANOVA 4x2x2 results of IDPs, class size, and students' level of expertise impact on students' perceptions of teaching effectiveness

| | SS | df | MS | F | p | Partial eta squared | Observed Power |
|---|---|---|---|---|---|---|---|
| Between-Subjects Effects | | | | | | | |
| IDPs | 7.815 | 3 | 2.605 | 4.765 | .003* | .012 | .902 |
| class size | 6.213 | 1 | 6.213 | 11.364 | .001* | .009 | .921 |
| students' academic year | 1.009 | 1 | 1.009 | 1.847 | .174 | .002 | .274 |
| IDPs* students' academic year | 7.861 | 3 | 2.620 | 4.793 | .003* | .012 | .904 |
| IDPs*class size | 12.273 | 3 | 4.091 | 7.483 | .000* | .018 | .986 |
| students' academic year * class size | .069 | 1 | .069 | .126 | .723 | .001 | .065 |
| Error | 663.127 | 1213 | .547 | | | | |

*Note:* significant * $p < .01$.

To have a better understanding of the IDPs impact in various contexts arising from the other variables (i.e., *IM*, *class size*, and *students' year of study*), we conducted a one-way ANOVA for each situation. The results (Table 3) indicated a significant improvement in SPTE when any of the theoretical IMs were compared with the teachers' current practice (F(3,1225) = 15.254, p < .01, d = .55). For *First-year students* (Table 4), the results showed a significant difference (F(3,223) = 5.302, $p < .01$, $d = .54$) between any two of the theoretical IMs (*Gagné* and *Engelmann*), as compared with the teachers' current practice. In the case of *non-first-year students*, we also found a significant effect of IM type (F(3,1001) = 15.918, $p < .001$, $d = .44$). In this case, *Adapted Gagné's IM* reported the highest effect ($M = 4.22$, $SD = .67$, $d = .54$) as compared with the "current practice" evaluation. Regarding *class size*, the results were divergent (Table 4). In the case of classes with *≤ 30 students*, there was no significant impact (F(3,571) = 2.369, $p < .05$, $d = .22$) between the usage of any IMs and teachers' current practice. In the case of classes with *> 30 students*, we found significant differences between all three IMs (F(3,653) = 21.272, $p < .001$, $d = .63$) and teachers' current practice. Thus, the results support the hypotheses of the study.

**Table 3.** ANOVA results for the impact of the IDPs on students' perceptions of teaching effectiveness

| | The three IDPs (named after the IMs used as content) | | | | | | | | F | d |
|---|---|---|---|---|---|---|---|---|---|---|
| | Teachers' Current Practice Models | | Gagné's IM | | Gagné's Adapted IM | | Engelmann's IM | | | |
| | (*n* = 394) | | (*n* = 330) | | (*n* = 270) | | (*n* = 232) | | | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | | |
| SPTE | 3.80 bcd | .80 | 4.08 a | .68 | 4,12 a | .74 | 4.14 a | .80 | 15.254* | .55 |

*Note:* * $p < .01$. Difference regarding the three IMs and teachers' current practices: Teachers' Current Practice Models (a), Gagné's IM (b), Gagné's Adapted IM (c), Engelmann's IM (d); according to posthoc comparisons *Games-Howell* because the test of homogeneity is significant in all six cases.

**Table 4.** ANOVA results of IMs, class size, and students' level of expertise impact on students' perceptions of teaching effectiveness

| Teaching Effectiveness | | IMs used as content in IDPs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Teachers' Current Practice Models | | | Gagné's IM | | | Gagné's Adapted IM | | | Engelmann's IM | | | | |
| | | N | M | SD | N | M | SD | N | M | SD | N | M | SD | F | d |
| IMs* students' academic year | First-year students | 85 | 3.76 bd | .78 | 23 | 4.28 ac | .74 | 51 | 3.67 bd | .86 | 65 | 4.12 ac | .87 | 5.302** | .54 |
| | Non-First-year students | 309 | 3.81 bcd | .81 | 307 | 4.07 ac | .67 | 219 | 4.22 ab | .67 | 167 | 4.14 a | .79 | 15.918*** | .44 |
| IMs* class size | ≤ 30 students | 130 | 4.14 | .72 | 122 | 4.25 | .59 | 169 | 4.03 | .79 | 151 | 4.19 | .80 | 2.369 | .22 |
| | > 30 students | 264 | 3.63 bcd | .80 | 208 | 3.98 ac | .71 | 101 | 4.27 ab | .63 | 81 | 4.03 a | .81 | 21.272*** | .63 |

*Note:* significant *$p < .05$, **$p < .01$, ***$p < .001$. The difference regarding the usage of IMs and teachers' current practice: Teachers' Current Practice Models (a), Gagné's IM (b), Gagné's Adapted IM (c), Engelmann's IM (d); according to posthoc comparisons *Hochberg GT2*, and *Games-Howell*. Only in the case of the variable *≤ 30 students* the test of homogeneity is not significant, consequently, the data shown in the table is according to the *Hochberg GT2* test.

## 6. **Discussion**

We explored whether learning IMs by medical academics through one-time pedagogical events could be an effective professional training practice. Such a research approach could address the request formulated by Amundsen and Wilson (2012) and Steinert et al. (2016) in what concerns the importance of shifting from evaluating the overall impact of IDPs to the evaluation of specific program characteristics (e.g., instructional content = IMs, in our case) to increase our understanding of whether, why and how different kinds of IDPs work. Also, we investigated the effect of our one-time pedagogical events on participants' student population perceptions of teaching effectiveness. Our findings added some new information to the narrow body of knowledge about the effect of IDPs on students. In their review study on 10 years of research, Steinert et al. (2016) presented that out of 111 studies, only 5 reported results on the participants' student population.

Our main results showed that using IMs as instructional content in one-time interventions had a medium effect size on students' perceptions of teaching effectiveness. Similar effects were reported by Hattie (2009) for the seven major steps of direct instruction presented by Adams and Engelmann (1996). Also, our results are in line with previous studies that reported a positive effect of one-time IDPs (based on IMs) on SPTE (e.g., Hampton and Reiser 2004). Hampton and Reiser (2004) conducted a controlled study and reported significant improvement in SPTE after a group of university teacher assistants received consultation on instructional practice based on Reiser and Dick's IM (Reiser and Dick 1996). These similarities could highlight the usefulness of IMs as instructional content in various forms of IDPs for academics.

Our results are convergent with the conclusions of the first meta-analysis (Ilie et al. 2020) published in the field of instructional development programs dedicated to academics. These authors concluded that one-time events could report a medium effect size when the pedagogical intervention aims to improve teachers' skills (Ilie et al. 2020). This is also the case for the three IDPs assessed in this paper. Our three IDPs aimed to develop academics' capacities to organize and implement teaching activities by using IMs.

When we analyzed the effect of *class size* and *students' year of study* on the final impact of IDPs, the results show small effects of *class size* and a no-significant effect of *students' year of study*. These results confirmed previous research on *class size* and student evaluations of teaching (Badri et al. 2006). Also, Hattie (2009) reported similar effects of the general impact of *class size* on teaching effectiveness. In the context of assessing the impact of IDPs, Stes et al. (2012) presented limited effects of *class size* and *students' year of study* variables. Stes et al. (2012) reported that non-first-year students increased their interest and enjoyment after their teachers participated in a instructional development program. Also, the same study showed a significant negative effect on support from teachers to students in larger classes, as perceived by them (Stes et al. 2012).

The present study investigated the impact of the use of instructional models on students' perceptions of teaching effectiveness in different contexts (i.e., classes with *≤ 30 students*, classes with *> 30 students*, *first-year* and *non-first-year students*). In classes with fewer than 30 students, the use of instructional models did not yield significant results. It has been shown that in small classes, students are more active and more likely to take responsibility for their learning (Finn et al. 2001). Thus, teachers could need more time practicing the application of an IM to significantly increase the level of students' perceptions of teaching effectiveness in classes with few students. In the other three

cases, the use of instructional models in higher education had a significant impact on students' perceptions of teaching effectiveness.

### 6.1. Implications for practice

Our results can be used to develop training activities for academics. First, instructional models (IMs) could be included as units in instructional packages of instructional development programs (IDPs) for academics**.** Such an approach could be useful for academic development centers in improving the content of in-service teacher IDPs. Also, IMs could enhance the theoretical frameworks used in IDPs to improve the academics' skills for organizing the courses or analyzing the lessons. Developing such skills for academics could be of particular interest to assure the quality of teaching in higher education. Noben and her collaborators (2020) showed that when clear and structured instruction was taken into consideration as a criterion for effective teaching, only approximative 60% of the academics observed in the classroom received a sufficient score. Also, academics could use IMs as teaching quality frameworks to carry out more effective self-assessments and/or peer-assessments of their instructional approaches (e.g., Kull et al. 2010). The peer review of teaching has been a significant instrument for assessing the quality of teaching in universities in recent decades. In this context, Johnston et al. (2022) highlighted that using a systematic teaching framework is a key feature of the IDPs dedicated to academics and based on the peer review of the teaching approach. Thus, academic developers could consider different IMs as teaching frameworks when designing IDPs based on academics' peer review of teaching.

We found that academics' involvement in one-time IDPs is associated with a significant enhancement of their students' perceptions of teaching effectiveness. Therefore, if we put together our results and those reported in previous papers that show positive effects of one-time IDPs (e.g., Baroffio et al. 2006; Notzer and Abramovitz 2008), some features of effective one-time events are highlighted: a) designing it by taking into consideration the academics' pedagogical needs and their daily teaching practice and b) setting improving teachers' skills as the aim of the pedagogical training. Thus, experts could consider developing in-service teachers' one-time IDPs using specific content, starting with needs analysis, and sustained by action research. The specialists in academic development can design an action research program based on an analysis of the academics' instructional needs. A series of one-time interventions with specific contents could be designed to address these needs, and each of these programs can respond to a particular teaching challenge (e.g., using student-centered methods, providing feedback, improving teacher-student relationships, etc.). Only the academics with a particular instructional need could attend that one-time IDP. In this vein, one could consider the example offered by Greer et al. (2016), which used the action research approach for designing and implementing a pedagogical intervention dedicated to early career academics.

### 6.2. Limitations and suggestions for further research

The findings of this study should be considered with due caution. The study had a pre-test -post-test research design and involved a small number of academics. Results may be influenced or not by some other variables (e.g., participants' gender or teaching experience). However, the large number of observations by students (n = 1226) mitigates, to some extent, the possibility of response bias. Therefore, future work can use the idea of this study and improve the research design by adding more academics to the sample and by including a control group.

This study analyzed the impact of three IMs as content in one-time IDPs. Future work could use other IMs (or other concepts such as curriculum development models or instructional strategies) as content in one-time events. Such research could provide evidence to substantiate if academics must know more IMs (and/or other educational concepts). Studies that compare different characteristics of IDPs implemented in the same context can have a significant contribution to knowledge about what works better for who and in which context (Steinert et al. 2016).

The academics involved in the study had different teaching experience. So, the study does not show if the results are the same for early career and more experienced academics. Future studies could use IMs (or/and other concepts) as content in one-time IDPs on two different groups of academics (beginners and seniors). Pre-service and in-service IDPs can be developed and tested for their impact on teaching effectiveness. The study reported the effects of one-time IDPs on SPTE in different contexts, namely first or non-first-year students, classes with ≤ 30 students, or > 30 students. However, given the small number of studies on these topics (Stes et al., 2010), future research is necessary.

## 7. Conclusion

The paper presented evidence of using instructional models (IMs) through one-time events for training academics to develop their skills to design student-centered teaching and learning activities. Academics' students-centered approaches to teaching seem to have a positive impact on students' active and deep learning (e.g., Prosser and Trigwell 2014; Uiboleht et al. 2018). For this reason, developing university teachers' skills to design and implement students-centered teaching and learning activities is one of the primary objectives of the European Bologna Process (Bologna Declaration 1999) and one of the main aims of the pedagogical development programs dedicated to academics in universities worldwide (Hicks et al. 2010). We showed that the usage of IMs to plan and teach classes with first-year students or classes with more than 30 students could have a medium effect size on students' perceptions of teaching effectiveness. Our results could encourage experts to include instructional models as content in current instructional development programs dedicated to in-service university teachers. Instructional development programs based on the peer review of teaching could be a specific type of such program in which instructional models could be used as systematic teaching quality frameworks for conducting the peer review process of teaching. This could lead to an improvement in the quality of the peer review of the teaching process across universities. In European universities, this could be also a means to better implement desirable Bologna Process practices as academics' peer review of teaching is promoted in our universities mainly because of the adoption of the Bologna Process. Also, academic developers could consider the enrollment of in-service academics in one-time events to increase their teaching skills. Such an approach should be a useful practice, especially if the one-time events will be designed by considering the academics' pedagogical needs and their daily teaching practice. For example, to develop academics' skills to teach using specific teaching methods (e.g., problem-based learning, inquiry-based learning, etc.) to promote students' active, deep, and reflexive learning.

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