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Abstract

The present study explores Finnish preservice subject teachers' perspectives and experiences with movement integration in academic classrooms. In the study, 44 subject teachers applied an integrated approach to infuse physical activity into a required teacher-preparatory course. The program's framework is the constructivist learning approach. Data were collected through interviews, classroom observations and field notes. The findings show that movement integration was a new concept for the preservice teachers and that their experience positively influenced their beliefs regarding the use of that concept in academic lessons. Thus, it is possible to support implementation of movement integration into secondary academic classrooms.

Keywords: subject teacher education, movement integration, constructivist learning theory

Highlights

- The majority of preservice subject teachers noted that movement integration can be easily incorporated into secondary academic classrooms.
- A constructivist learning environment can facilitate preservice subject teachers' development of confidence and competence.
- Preservice physical education teachers can be prepared to extend their role to include the promotion of physical activity.
- Movement integration has positive implications for secondary students, thus extending previous findings on primary students

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1. Introduction

Children and young people spend a large fraction of their weekday waking hours in the school context and there is potential to help most students to break up their periods of sitting and to increase their physical activity, as both primary and secondary students sit during most of their school time (Dinkel, Schaffer, Snyder, & Lee, 2017; Hivner et al., 2019; Tammelin, Laine, & Turpeinen, 2012). Therefore, Finland launched a comprehensive school programme in August 2010 to encourage daily physical activity; this programme follows best practice for incorporating physical activity throughout the school day (Chen & Gu, 2018; Erwin, Beighle, Carson, & Castelli, 2013; McMullen, Ní Chróinín, Tammelin, Pogorzelska, & van der Mars, 2015; Russ, Webster, Beets, & Phillips, 2015; Taylor et al., 2018). The Finnish Schools on the Move programme is a government initiative and uses a bottom-up approach to create a physically active culture in Finnish comprehensive schools; the participating schools and municipalities implement individualized plans to increase physical activity during the school day (Haapala et al., 2014; Tammelin et al., 2012). According to an initial evaluation of Finnish Schools on the Move, the teachers in the programme reported that the increased physical activity throughout the school day made the school environment more peaceful and enjoyable than it was before the programme (Kämppi et al., 2013). However, with regard to their experiences with the programme and attitudes towards adding physical activity to the school day, secondary teachers (also called *subject teachers*) were less favourable than primary teachers.

One cost-effective strategy that the programme uses is movement integration (MI), which refers to the use of physical activity or movement of any level of intensity in academic lessons (Webster, Beets, Weaver, Vazou, & Russ, 2015). The implementation of MI can

improve students' behaviour and engagement by breaking up or reducing their sitting time. MI has various forms, such as incorporating movement into academic concepts within the existing curriculum or using physical activity as an actual physical break from academic tasks and sitting. The evidence from comprehensive and systematic reviews of MI suggests that, in addition to decreasing students' sedentary behaviour and increasing their physical activity, it can also contribute in various ways to students' physical, cognitive, and social-emotional development (Erwin, Fedewa, Beighle, & Ahn, 2012; Martin & Murtagh, 2017a; Norris, Shelton, Dunsmuir, Duke-Williams, & Stamatakis, 2015; Singh et al., 2019; Watson, Timperio, Brown, Best, & Hesketh, 2017). For example, in recent publications based on student data, scholars have demonstrated that MI improves students' physical activity (Erwin, Beighle, Morgan, & Noland, 2011; Goh et al., 2013; Martin & Murtagh, 2015; Murtagh, Mulvihill, & Markey, 2013; Riley, Lubans, Morgan, & Young, 2015), attention and on-task behaviour (de Greeff et al., 2016; Ma, Mare, & Gurd, 2014; Mahar, 2011; Mullender-Wijnsma et al., 2015; Riley, Lubans, Holmes, & Morgan, 2016), and academic achievement (Donnelly & Lambourne, 2011). However, research is needed in secondary settings to confirm these findings.

Teachers have a central role in employing MI in schools and they report positive experiences with and perceptions of MI after implementing it during academic lessons (Dinkel et al., 2017; Dyrstad, Kvalø, Alstveit, & Skage, 2018; McMullen, Martin, Jones, & Murtagh, 2016; van den Berg et al., 2017; Webster et al., 2017). In addition, students perceive the use of MI in academic classrooms to be more enjoyable and motivating than traditional, sedentary lessons (Martin & Murtagh, 2017b; Mazzoli et al., 2019; McMullen, MacPhail, & Dillon, 2018; Taylor, Noonan, Knowles, Owen, & Fairclough, 2018; van den Berg, Vos, de Groot, Singh, & Chinapaw, 2018; Vazou, Gavrilo, Mamalaki, Papanastasiou, & Sioumala, 2012). Although researchers report positive findings from MI interventions, to the best of our

understanding, the majority of those who have explored MI's effects on academic lessons have focused on primary, not secondary, classrooms.

Despite the benefits of MI with regard to students' well-being and academic performance, teachers may not implement MI activities according to plan. For instance, some use MI less frequently or for shorter lengths than potentially intended by the intervention, and others make modifications to the MI activities (Webster et al., 2015). The major barrier reported to implementing MI in academic lessons is insufficient time; teachers perceive MI as an addition to an already busy schedule and express concerns about meeting their curricular demands. Other barriers to primary teachers' use of MI include a lack of materials, physical space, or available resources; concerns about classroom management and student participation; a lack of social or financial support, and insufficient training or experience (Carlson et al., 2017; Dinkel et al., 2017; Dyrstad et al., 2018; Goh, Hannon, Webster, & Podlog, 2017; Hivner et al., 2019; Martin & Murtagh, 2017b; McMullen et al., 2016; Quarmby, Daly-Smith, & Kime, 2018; Webster et al., 2017). Overall, the majority of researchers who have looked at MI have focused on primary teachers, so little is known about the use of MI in secondary lessons.

In an effort to encourage teachers to deal with the barriers to the implementation of MI, scholars have presented several approaches. Martin and Murtagh (2017a) noted that some research teams have implemented MI lessons themselves, whereas others have only assisted teachers with the planning and execution of MI intervention programmes (e.g., by providing them with resources or training). MI training typically includes lesson ideas, resources, encouragement, information about MI, and technical assistance (Carlson et al., 2017; Knudsen, Skovgaard, & Bredahl, 2018; Martin & Murtagh, 2017b). In an evaluation of a MI training programme for classroom teachers, Stewart et al. (2019) concluded that such trainings should be authentic experiences with active learning opportunities such as

observations, presentations, analysis of student work, and feedback. Furthermore, teachers who received support from other teachers in addition to their MI training, materials, and technical assistance for implementing MI into academic classroom were more likely than those who did not receive such support to implement an intervention (Carlson et al., 2017). Interestingly, several scholars have suggested that physical education teachers could take a leading or supporting role in promoting MI (McMullen et al., 2016; Webster, Beets et al., 2015). However, most teacher education programmes do little to prepare physical education teachers to support the adoption and implementation of MI for the promotion of physical activity (Chen & Gu, 2018).

The first step in addressing the lack of MI in secondary classrooms is to approach the topic during teacher education. Preservice secondary teachers are especially important because the teacher education setting allows preservice teachers to become more flexible in their professional identity and in their thoughts about instruction and learning. Because teacher education occurs early in teachers' careers, learning about MI in that setting allows them to incorporate the resulting knowledge and skills in their classrooms. Therefore, they may feel willing to use MI as part of their routine classroom practices.

Thus far, researchers have not developed neither a model of professional competencies for subject teachers' use of MI nor a plan for adjusting teachers' education to their individual needs. However, researchers in the area of preservice classroom teacher education have supported the significance of certain MI elements in teacher training. Preservice classroom teachers who completed university coursework on the promotion of physical activity (including MI), as compared to those who did not, showed higher perceived competence in MI (Goh et al., 2013; Michael et al., 2018; Robertson-Wilson et al., 2018); they also experienced positive changes in their willingness to integrate MI (Linker & Woods, 2018; Webster et al., 2013). Although such trainings have been successful, preservice classroom

teachers' perceived barriers regarding the use of MI (e.g., a lack of time or a lower priority relative to other subjects) are consistent with those of in-service teachers (Goh et al., 2013). Webster et al. (2013) even noted that, when preservice classroom teachers are more willing to integrate movement, they perceive fewer barriers to implementing MI. Michael et al. (2018) suggested that, if MI is to be promoted in university coursework, the following are important for preservice teachers: learner ownership, collective work, access to authentic contexts, reflection, and both emotional and psychological support. Other scholars have noted the importance of field-based teaching experiences, in which preservice teachers integrate movement in real-world classrooms (Linker & Woods, 2018; Robertson-Wilson et al., 2018; Webster et al., 2013). Consequently, there is a need to understand how preservice subject teachers (PSTs) use and perceive MI as part of the teacher education programme; doing so would broaden the understanding of these teachers' early career phases and could promote the use of MI among all subject teachers. Therefore, the purpose of this study is to explore Finnish PSTs' perspectives and experiences related to the use of MI in academic classrooms.

2. A constructivist learning approach in teacher education

Because no researchers have mentioned PSTs' implementation of MI in academic classrooms, further research is needed about the best instructional and learning settings for training PSTs in MI in order to inform teacher educators about potential recommendations. If the education of PSTs includes preparation for the inclusion of MI in academic classrooms, then the available learning experiences need to be aligned with the results from the theoretical and empirical literature regarding how preservice teachers learn. Researchers have focused extensively on constructivist learning theory in the contexts of education, teacher preparation, and policy construction, and their results indicate that it is a relevant, productive, and empowering framework for instruction (Fosnot & Perry, 2005; Richardson, 1997).

As a theoretical framework, constructivism's strongest influences are the works of

Piaget and Vygotsky (Richardson, 2003). In constructivist learning theory, generally, the student is a central agent in the learning process, and learning is an active procedure that builds on prior (socially constructed) knowledge (Beck & Kosnik, 2006; Rovegno & Dolly, 2006). Thus, constructivist learning environments include active engagement, problem-solving, and collaboration, all of which promote students' autonomy and initiative (Harfitt & Chan, 2017). Unlike in the traditional teaching approach, in which the teacher uses a direct instructional strategy and is the major provider of information, in the constructivist approach, teachers and students have distinct responsibilities; the teachers guide the students and facilitate their learning (Powell & Kalina, 2005).

In an analysis of constructivist pedagogy, Richardson (2003) noted that it is student-centred, involves the use of group dialogue to foster shared understanding, includes formal knowledge, causes students to reflect, and develops the students' awareness of their own understanding. Furthermore, Fosnot and Perry (2005) listed the following constructivist teaching principles, all of which have implications for teachers' instructional practices:

1. Learning is developmental.
2. Learning requires cognitive dissonance, as errors and conflicts support learning.
3. Reflection promotes learning and is connected to both personal experience and prior knowledge.
4. Learners are at the centre of the learning community and are involved in it.

These principles are evident in student-centred teaching approaches, and several researchers (Dyson, Griffin, & Hastie, 2004; Light, 2008) have even emphasized the congruency between model-based instruction in physical education (e.g., cooperative learning, sport education, and teaching games for understanding) and constructivist learning theory.

The shift in teacher education towards constructivist learning principles will challenge the traditional university curriculum, which is too often focused on academic knowledge

(Harfitt & Chow, 2018). Thus, teacher education and particularly research-based teacher education programmes can provide and have provided a logical starting point for the pedagogical change process (Darling-Hammond, 2017; Light, 2008). There is evidence that teacher educators in various content areas have been pursuing constructivist pedagogical theory and practice (Beck & Kosnik, 2006; Niemi, 2002; Richardson, 1997). More recently, many researchers have reported that constructivist teaching, with its emphasis on the creative and innovative process of knowledge acquisition, can be used to improve outcomes and promote positive attitudes and confidence among both generic preservice teachers (Izadinia, 2015; Machado & Wang, 2018) and preservice physical education teachers (MacPhail, Tannehill, & Karp, 2013; Sinclair & Thornton, 2018). Additionally (and of particular interest for this study), Michael et al. (2018) concluded that a constructivist-oriented university course can facilitate learning on MI and provide beneficial experiences for preservice classroom teachers. In a review of the support for constructivist teacher education, Harfitt and Chan (2017) stated that the creators of constructivist pedagogical strategies need to recognize preservice teachers as individuals within a social context, as this will prompt constant reflection and provide varied learning experiences, both inside and outside of the university classroom. Therefore, constructivist learning principles can support curricular decisions in secondary teacher education.

3. Methods

3.1. Setting and Participants

In the Finnish context, at the primary level (Grades 1–6), classroom teachers typically provide general education. Teachers at the secondary level (Grades 7–12), however, are specialized subject teachers; they are the focus of this study. All primary and secondary teachers in Finland must have master's degrees and show a high level of academic competence (Kansanen, 2014). However, no common national standards exist for teacher

education, so each university is accountable for the quality of its own teacher education (Niemi, 2011). Each PST must complete a major and one or two minors in academic teaching subjects. Each teacher then must apply to a department of teacher education in order to earn a substantial minor in pedagogy, which is a prerequisite for teaching in secondary schools.

We conducted this study at a Finnish university that requires all PSTs to complete a five-credit pedagogical course as part of their pedagogical studies during their last semester before graduation. In the spring of 2018, as part of this required course, 28 female and 16 male PSTs (aged around 24 years old) participated in an integrated approach known as learning by moving (LbM). The goal with this part was to introduce physical activity promotion through MI. The PSTs had various academic majors (Swedish ten, Physical and Health education (PHE) seven, History six, English five, Religion five, Social studies four, Finnish three, Mathematics two, French one, and Philosophy one). The first two authors developed and delivered the course, thus were also responsible for organizing all data collection. The other authors were peer tutors in the project. We obtained both institutional approval and the participants' written informed consent prior to conducting the study.

3.2. Curriculum

The LbM programme is aimed at preparing the participating PSTs to effectively implement MI as actual physical breaks from academic tasks and as an integrated part of academic activities during teaching in secondary classrooms. This programme had a focus on teaching both pedagogical and subject content. Based on constructivist learning theory, the programme included socially embedded learning (e.g., teamwork and collaboration), opportunities for learner ownership, exposure to authentic situations, active learning, reflection, and lecturer as facilitator, all of which are central elements in the university's coursework that help prepare PSTs to implement MI.

The LbM programme includes three components: university studies, tutor support, and

student teaching (see Figure 1). In this study, a 17-week (semester-long) program began with a 3-week university-based period that included studies of pedagogical and didactic content. This was followed by 5 weeks of student teaching in secondary classrooms at the university's laboratory school. The PSTs then engaged in 3 additional weeks of pedagogical and didactic studies at the university, followed by 5 more weeks of student teaching and 1 final week at the university.

3.2.1. University-based component (1)

The first university-based component comprised a half-day workshop that was intended to provide background to the PSTs so that they could change their attitudes and behaviours towards the use of MI in academic classroom at the secondary level. In this first portion of the workshop, we addressed the benefits of physical activity, the typical characteristics of whole-school physical activity promotion, the most appropriate MI practices, and the need for lesson planning. We started the session with a short introduction of the study, before introducing three guest speakers: a male principal from a secondary school that is involved in the School on the Move programme, a female classroom teacher with significant experience in the use of MI in her school, and a researcher and instructor from the national School on the Move programme. The objective of bringing in these guest speakers was to provide the PSTs with realistic voices from teachers who are involved in MI. In addition, each of the guest speakers had previously given similar presentations. The guest speakers incorporated physical activity breaks and active-learning scenarios regularly throughout the session. In addition, they contributed to the experience by using activities similar to the ones they use with students in their own classrooms. The session ended with a period for group work and collaboration, which was intended to create student interaction and discussions on how to come up with MI activities.

3.2.2. Peer tutor

For this study's participants, we reinforced communication, networking, and support from other PSTs in the implementation of MI by including a tutor-support component. We chose to use tutor support as a primary mechanism for delivering MI concepts to the PSTs based on two facts. Firstly, physical education specialists are often referred to as *physical activity leaders* or other similar titles (Carson, Castelli, Beighle, & Erwin, 2014), which points to physical activity promotion playing an expanded role in professional assignments for physical education teachers. Several scholars in the field (e.g., Chen & Gu, 2018; Webster & Nesbitt, 2017) have proposed that teacher educators should provide preservice physical education teachers with formal learning experiences that involve the planning and implementation of physical activity promotion strategies. Therefore, we assigned six female and one male PHE PSTs as peer tutors for the other PSTs.

Secondly, peer tutoring is an effective learning tool at the university level, and its benefits are well-documented across a range of educational settings (Gershenfeld, 2014; Lunsford, Crisp, Dolan, & Wuetherick, 2017; Terrion, & Leonard, 2007). Because the training and orientation provided to mentors is critical to the training of peer tutors (Cornelius, Wood, & Lai, 2016), The first author provided three sessions for all the tutors prior to the workshop. During these 1.5-hr sessions, the peer tutors received training in the form of readings and discussions about the academic benefits of physical activity in general and MI in particular. To set the tutors' expectations about their role, we also provided relevant research findings about teachers' experiences with MI, participatory demonstrations of MI, and sufficient MI resources. We asked each tutor to have two formal meetings with the randomly assigned interdisciplinary group (which comprised six or seven PSTs). In the first in class meeting, which was scheduled for the day after the initial workshop, which was meant to reinforce learning, the tutors discussed the workshop experience with the PSTs and provided them with handouts to help them plan and implement MI sessions in their teaching. The

second group meeting occurred after the PSTs completed their first 5 weeks of student teaching; in this outside of class meeting, the PSTs shared their experiences, and the tutors discussed the challenges that they had faced during their own student teaching. The tutors also provided feedback for the PSTs to use in their next teaching sequence. In addition, the tutors provided individual help to the group members when needed and supervised at least one group member's application of MI.

3.2.3 Student teaching

As a requirement of the course, each PST, also the peer tutors in Health education classes, had to implement at least two lessons with MI in their secondary classrooms during the student-teaching component. The PSTs thereby had authentic experiences of including movement breaks in an academic lesson and/or of incorporating active movements into such a lesson (Linker & Woods, 2018; Robertson-Wilson et al., 2018; Stewart et al., 2019).

Consequently, the PSTs implemented one MI lesson during the first 5 weeks of student teaching and another during the second 5 weeks, based on their personal preferences. If they wanted, they could include MI in more of the 12 to 15 lessons that they taught during the practice sequence.

3.2.4. University-based component (2)

Finally, the last university-based component involved a 2-hr workshop. During the first part of this workshop, the PST groups met to share and discuss their experiences and to plan their presentation to the whole class. During this part of the study, each peer tutor was responsible to generate a discussion based on some sample questions from previous research and developed by the first two authors. During the last part of the workshop, each group presented its members' learning experiences and conclusions. A general discussion about the LbM programme took place after the presentations.

3.3. Data collection

Given our intentions in this study, we adopted a qualitative approach so that we could explore in detail the PSTs' understanding and experiences related to the implementation of MI in secondary academic classrooms. We collected data from the focus-group discussions, individual semi-structured interviews, and workshop activities at the end of the academic semester; we conducted the classroom observations of MI instruction and held informal discussions throughout the project. Focus groups create an opportunity for participants to engage in thoughtful conversations about the topics of interest. We used a discussion guide to elaborate on the PSTs' learning experiences (with focus on what worked well), the challenges that the participants faced related to MI, the types of activities that they used most, their reasoning for when to implement MI, the students' responses to MI, and the overall strengths and weaknesses of the LbM programme.

We audiotaped and transcribed four discussions and took field notes to document the relevant information from four others. The focus group discussions (25 – 35 min.) were conducted in tutor groups (6-7 PSTs) during class time. We also audiotaped and transcribed the group presentations about the PSTs' learning experiences and the general discussion from the last workshop (45 min.). The first author conducted formal, individual, and semi-structured interviews with four PHE PSTs to explore their experiences with learning from tutors during the LbM programme and their perceptions of the impact that the project would have on their PSTs' implementation of MI. We conducted all the interviews in a uniform manner (Patton, 2014), and each lasted 15 to 25 min. We audiotaped and then transcribed the formal interviews. We also observed the PSTs during their application of MI in the classroom, and our field notes included a predominant focus on the content of the participants' MI activities. We kept self-reflection journals to record our thoughts and experiences during the LbM project. Finally, we held informal conversations with each of the participants during the project and documented these conversations when relevant information arose.

3.4. Data analysis

We analysed the data using inductive thematic analysis, which is a data-driven process (Braun & Clarke, 2012). In line with Clarke and Braun's (2013) guidelines, two of us (JER, MB) became familiar with the data by repeatedly reading the transcripts and looking for similarities, contradictions, and contestations across the whole data set. We first hand-coded the transcripts and individually developed an initial coding framework based on the identified categories and the subthemes that emerged from the data. Then we collaboratively used these categories and themes to form a coding index as a means of organizing the whole data set. However, we then refined the coding index continually throughout the data-analysis process whenever new insights emerged. When codes depicted similar ideas, we collated them to form themes that the two of us then reviewed, discussed, and revised. Thus, these codes and themes derived largely from the data. Consequently, we drew upon previous research on primary teachers' implementation of MI in order to interpret the experiences of the PSTs in this study. The final analysis involved defining and naming the themes, then choosing the data excerpts that best represented each theme so as to allow for a more in-depth analysis (see Table 1). To ensure the credibility and trustworthiness of the analysis, we utilized data triangulation using multiple data sources, formal and informal member checking, and participant quotes (Patton, 2015). In addition, we analyzed all data after the PSTs had completed the course and they were not awarded grades for their participation in the LbM project. We assigned all participants pseudonyms to maintain their anonymity and provided quotes from the transcripts to show the subcategories within each theme.

4. Results

After analysing the data, we identified three main themes related to the PSTs' work with MI, MI and secondary students, and a constructivist learning environment. These themes are apparent across all data. We also identified several subthemes. The themes and subthemes

are presented below, with interview quotes and observations as evidence.

4.1. PSTs' work with MI

The theme of the PSTs' work with MI refers to the ways that they used MI when teaching academic lessons. We identified three subthemes within this theme: MI strategies, MI implementation, and PSTs' awareness of MI.

4.1.1. MI strategies

The subtheme of MI strategies is related to how the PSTs incorporated MI into their teaching. They noted that MI can result from only small changes to their traditional teaching methods. Lena (PHE= academic teaching subject; T= Tutor) said, "We thought it was easy to find activities that activated the students, and it doesn't always have to be so complicated." Several PSTs preferred to incorporate MI into naturally occurring, functional teaching strategies and transitions. Camilla (Swedish) said, "I have tried to introduce small changes so that the students get up occasionally; I have the students come and collect their papers instead of handing out the papers, and they sometimes get to write on the board." These strategies interrupt the students' sedentary time, but no major changes are required to reduce the amount of time when students sit and to increase their physical activity during the lesson. Other strategies that the PSTs preferred include multiple learning stations around the classroom (allowing students to move from one to the next), partnerships and small-group activities in which the students must stand, and variations in the locations of instruction. Mats (Religion) said, "When the students during one of my lessons had to move freely in the classroom and discuss, this stimulated the discussion in a completely different way than when they were sitting in groups—more genuinely in some way." The PSTs also used some activities that were not connected to the teaching subject, including various forms of brain breaks, stretching, and dancing along to a video.

The PSTs also used active instructional methods linked to the academic subject; Jonas

(History) said that MI “indirectly supports these learning outcomes for the lesson.” However, these activities were more demanding than unconnected ones, as Lisa (Religion) explained: “What I find most challenging is to connect it [MI] to the subject.” The PSTs frequently used drama-based pedagogical (DBP) methods to integrate movement into a specific academic subject. DBP is a collection of teaching tools, which include activating dialogue, image work, and role work. Hanna (Swedish) said, “They got, just using drama, to show how the interview process works.” Jenny (Social studies) also noted, “I have realized that drama pedagogy is both fun, inspiring, and activating for the students.”

4.1.2. MI implementation.

The subtheme of MI implementation relates to the PSTs’ instructional decisions related to MI. All teaching starts with a planning process, and several of the PSTs noted that they needed to pay attention to MI during planning. Hanna (Swedish) said, “What I have learned the most was that I had to take the time to plan [MI], and that it [MI] could take that time when it was planned.” Likewise, Petra (PHE; T) said that MI “has become a natural part of our planning.” The participating PSTs also noted that routines and clear instructions for how to start and stop MI activities are essential. Kati (French) said, “You have the opportunity to build up these routines to make them work for real.” The PSTs felt that they, as teachers, needed to actively participate in the MI activities in order to build up the students’ trust. Sofia (History) said, “If I just had them do the activity, I do not think they would have been as comfortable with me as they are when I participate myself”; she used the “floss” dance as an example of how her participation was helpful.

Although these instructional decisions helped the PSTs apply MI, they also noted that MI can create some noise and chaos, particularly with large groups. Kati (French) noted that, “When you include this kind of activity, you need to completely accept that the result is not always order and full control, and you need to tolerate that movement.” One concern that

some PSTs expressed was that students could have problems calming down and focusing on academic tasks after a movement activity. Pia (Finnish) said, “It can be difficult for the students to return to the task if it has been a really fun activity; at times, they do not want to sit down.” Another concern was that teaching facilities are not always appropriate for MI. Many classrooms are crowded with desks and chairs, which makes MI more challenging. Mats (Religion) said, “If we are really to do this [MI], then you need to think about how these facilities really look and how big the groups are.”

4.1.3. PSTs’ awareness of MI.

This study’s results show a clear progression in PSTs’ awareness of the significance of physical activity in their student teaching. Martin (Philosophy) noted that the interaction between the didactic aspects of physical education and other subject areas was a new concept: “It was an eye-opener.” Initially, the PSTs had a range of attitudes towards MI: neutral, questioning, or excitedly positive. In addition to Martin, several other PSTs had not consciously thought before this course that it would be important to include physical activity in their teaching in academic classrooms. The PSTs were more enthusiastic about MI when they were already familiar with activating teaching methods. Beata (PHE; T) noted at the beginning of the course, for example: “Half of my group was really eager and had worked with this, and they could build on their experiences and have a vision . . . and then there were some who thought, ‘This will be difficult to do.’” Similarly, Ulla (PHE; T) said, “I was very sceptical at the beginning because I thought there were more important things to focus on at that stage, but I have to admit that I am nicely surprised.” Anki (English) described that the initial understanding was a release: “We realized that it does not have to be an aerobic lesson or anything that is related to the subject; it is enough to include small activating details.”

The PSTs particularly expressed their increased awareness of MI and its significance in learning as part of their reflections on the planning and teaching of academic lessons. For

instance, Mats (Religion) said, “For me, the most important thing has just been that it [MI] has become a part of how I think about the lesson . . . I can include an active part, and it comes quite naturally.” This increased competence and confidence also related to their didactic courage in trying MI. Kirsi (English) said, “I have learned that, above all, one should dare to simply try it.” According to most of the PSTs, adding MI required no major or time-consuming changes. For instance, Pia (Finnish) said, “It is the way of thinking that one should change. With small changes, . . . teachers contribute more and students will get more movement.” Finally, Mats (Religion) summarized the significance of MI for him: “What most influenced my thinking during this spring on the subject of didactics is probably this project.”

However, at the same time, incorporating MI into practical teaching was challenging and required increased effort. For instance, Hanna (Swedish) said, “For me at least, I certainly have had to reflect on it.” Mats (Religion) pointed to the time he spent planning and to his many expectations as challenges related to “this lack of time. We have had quite high demands from both the supervisor and the university about what to include in our lessons, which causes a time shortage, and you have to prioritize, so MI is often forgotten.” Similarly, Christoffer (Swedish) said, “There is so much to think about.”

4.2. MI and secondary students

The second theme is how MI relates to the PSTs’ students. We identified two subthemes: the students’ experiences with MI (and its benefits) and the fact that the PSTs needed to recognize various students.

4.2.1. Students’ experiences with MI and its benefits.

The PSTs noted that MI is important because students in academic classrooms spend most of their time sitting, such that sedentary behaviour is typical of the school day. Lena (PHE; T) said, “I consider it important to think about how we can interrupt sedentary behaviour because we are all aware that students are sitting too much.” In attending to these

concerns related to MI during their teaching practice, the PSTs noted how MI increased the students' efforts and thereby, their academic achievement. Oskar (Religion) said, "Regardless of the type of [MI] activity involved, the activity can increase students' productivity and work quality during the lesson," and Sandra (Finnish) said, "We have experienced that MI is important and that it promotes students' learning opportunities." During academic lessons, the PSTs noted that students started to lose their focus after about 30 min of lecturing; therefore, they implemented MI activities at that frequency. Sofia (Religion) said, "When lights start to go out, and you notice that you have no longer have full contact with the students, you can take a break, and after that, you again have their attention." Similarly, Robin (History) stated, "I have noticed that my class, at least, that they were able to listen much better when they have had MI." The PSTs also perceived that, in addition to these concrete learning benefits, the togetherness of MI activities affected the social climate and group cohesion. Mikael (Religion) said,

One thing that I noticed and that I had not expected was that this [MI] could help the social climate. Both between the students, as they have to interact with each other in a different way than just discussing a task with each other. Then, when you use the whole classroom and not just sitting in their own places all the time. I also think the relationship between me and the students improved, as we got to connect with each other in a different way.

The PSTs noted the usefulness of MI for student learning, and they also felt that most students participated actively and enjoyed the MI activities. Lena (PHE; T) said, "The students surely reacted positively to the activities," and Casper (Mathematics) added, "Most students participated in the various activities." However, some PSTs noted a slight initial resistance, including Sabina (Swedish): "I've indeed gotten some sighs; they participated later, but the first reaction was, 'Do we have to?'" This resistance was also evident in one

classroom observation: “One student experienced the movement break as ridiculous and chose to protest by not moving at all in the beginning.”

4.2.2. Recognition of various students.

The second subtheme is related to the PSTs’ need to recognize various students. Although a subject teacher can teach as low as Grade 7 in lower-secondary school to as high as Grade 12 in upper-secondary school, all of them have to deal with students from various age groups and development levels. The PSTs noted that MI needed to be implemented in different ways, depending on the student group. Sofia (Religion) said, “Age is something that you have to think about, as you may not be able to have the same tasks for Year 7 in the lower-secondary level as you have in upper-secondary classes.” The PSTs felt that it was easier to implement MI with the students from the lower-secondary level than with those from the upper-secondary level. As an example, Emma (Social studies) said, “There is apathy in upper secondary. Some students are very lazy, and they refuse to move. At the lower-secondary level, it was easier to bring all the students along.” Nevertheless, Simon (History) noted, “I have had only upper-secondary school students so far, and it [MI] has worked quite well.” One challenge with teaching upper-secondary classes is that most available material is related to elementary-school students, as Peter (Mathematics) noted: “Finding adaptable material for MI is considerably more difficult when it comes to upper-secondary students.” The PSTs recognized that, in addition to grade level, other student characteristics affect every teaching situation. Hansi (Swedish) said that he had

to think about how this group works, and ask, ‘Is this task appropriate for this group?’

Alternatively, is it a group that is more quiet or is it a group which need to get rid of their energy, and you have an eye for that also.

Lena (PHE; T) added, “It also depends on which group you teach and what the mood is like within the group.”

4.3. A constructivist learning environment

The third theme reveals that a teacher-education course based on the constructivist learning theory can support PSTs' learning. We divided this theme into three subthemes: peer tutors, learner ownership, and shared learning in small groups.

4.3.1. Peer tutors.

One central feature of the constructivist learning approach is the use of peer tutors, as this process emphasizes learning through teamwork. Thus, we embedded collaboration in the social context of this course. The tutor's role can be described as initiating the process and helping other PSTs to implement MI in their academic lessons. For instance, Petra (PHE; T) stated, "I have felt like such an inspirational person," and Ulla (PHE; T) noted that she initially had to promote the importance of MI to the other PSTs in her group. The tutors had to be prepared and to be knowledgeable about MI. Petra (PHE; T) continued, "When others do not have the same background as me, . . . I can offer them something that they do not know as well as I do." Further, Petra (PHE; T) explained the importance of the initial tutor training in providing knowledge about MI: "It was really good that we had a meeting before we became tutors, as we had to think about things . . . and prepare for the topic." Therefore, the tutors, in the beginning, played the role of experts by directly or electronically sharing lesson ideas and materials with the other PSTs. Beata (PHE; T) said, "We had that meeting in the beginning in which I gave information and examples, and some PSTs asked questions about more topics, so I gave them further information." The role of the tutors changed to peers as the programme went on; Lena (PHE; T) explained that she started as an expert only "to later be at the same level" as the others. The tutors also noted the change in the PST relations and indicated that they had learned about MI. Beata (PHE; T) said, "I learned a lot of new information, and I got so many ideas for my own teaching;" Lena (PHE; T) also noted, "I can always learn more; when you tell me what you have experienced, then I will also learn something."

4.3.2. Learner ownership.

The PSTs' ability to select a structure and to choose when and how to implement MI in their academic lessons shows that learner ownership can be a main feature in teacher-education courses that are based on constructivist learning theory. The data from the classroom observations and group discussions show that the PSTs used many MI alternatives during their academic lessons. Lena (PHE; T) said that she and the other PSTs "had to be responsible for their own learning" and "could decide how much and what they wanted to implement." As results, "they were more willing to do this [MI] when they got the freedom to decide themselves."

4.3.3. Shared learning in small groups

All the participants used shared learning, particularly within the small groups. When the university lecturers were the only facilitators in the classroom, small groups (each with five or six PSTs and one tutor) were important arenas for professional learning. The groups' cohesiveness came from the fact that all of the PSTs had participated in the same pedagogical course; even though many had different majors, they all had completed about 4 years of university studies and were almost qualified teachers. In those groups, Ulla (PHE; T) noted, "We all learned from each other." When the groups of PSTs discussed and reflected on their teaching experiences, Petra (PHE; T) talked about "A collegial learning environment in which all members contributed to same extent." Beata (PHE; T) added that they had "discussions about different class levels, problems, and subjects because they were from all subject groups, . . . and then they had to realize that it is possible to make MI work with such tools in all subjects." In addition, Ben (History) noted that "we created a folder on Drive, where we share all materials that we now have produced." However, finding common times for group meetings was a challenge, as Petra (PHE; T) said: "It was a little hard to find time to meet when everyone has their own lives, jobs, and lesson planning."

5. Discussion

The purpose of this study is to explore Finnish PSTs' perspectives and experiences related to the use of MI in academic classrooms. This study's results add new knowledge to the existing literature, as past researchers have mainly focused on primary teachers' implementation of MI. The PSTs who participated in this study provided their insights about the use of MI during the final year of their teacher education studies. It is essential to understand MI from the PSTs' perspectives, as they are significant stakeholders who will be in a position to implement MI in their careers. To our knowledge, this is one of the first studies in which scholars have applied constructivist learning theory during teacher education as a means to study MI. This study's results suggest a need to focus on integration, critical reflection, inquiry, and community so as to change preservice teachers' beliefs and attitudes.

5.1. Movement integration by preservice subject teachers

Although previous researchers have indicated that experiences and attitudes towards additional physical activity are less positive for secondary teachers than for primary teachers (Kamppi et al., 2013), we showed that PSTs can adopt and incorporate MI during student teaching in secondary academic classrooms. Over the course of the semester, the PSTs' perceptions of using MI in the classroom improved, and their confidence and competence in implementing MI increased; in the end, they had positive attitudes towards MI. Their authentic and active learning opportunities were central in building their competence and confidence in delivering MI lessons within secondary classrooms (Quarmby et al., 2018; Stewart et al., 2019). This finding is in line with those of previous studies on primary preservice and in-service teachers, suggesting that PSTs' training needs to complement the teacher education curriculum and support learning (Goh et al., 2013; Linker & Woods, 2018; Michael et al., 2018; Robertson-Wilson et al., 2018; Webster et al., 2013). Webster, Russ et

al. (2015) also suggested that classroom teachers' preservice education should include training in MI. In this study, all the participating PSTs incorporated at least two MI activities during their student teaching; this result challenges the findings from previous studies, which imply that, compared to recommended levels, teachers use MI less frequently and for shorter lengths or with modifications (Quarmby et al., 2018; Webster, Russ et al., 2015). This finding could be attributed to the design of the course in this study, as it included a compulsory MI teaching component during a few lessons; however, the PSTs were not forced to extend beyond their comfort zones.

The PSTs incorporated MI strategies into their academic classrooms using a wide variety of activities. This indicates that the PSTs in this study had a low threshold and perceived MI as easy and straightforward to integrate into their teaching an academic subject at the secondary level. Specifically, their use of MI included elements of everyday movements such as getting up, retrieving material, and participating in activities at the front of the classroom. In addition, MI has been about elements with physical break after longer periods of sedentary behaviour. In addition, the PSTs incorporated MI to help the students focus on the academic content. Thus, MI was either subject-neutral in nature or had direct, subject-specific elements (Webster, Russ et al., 2015). Therefore, based on this finding, we suggest that PSTs should be presented with various clear options for the use of MI—both in the academic context and otherwise (Goh et al., 2017). The PSTs' experience of MI as simple, fun, and inspirational is related to the positive response that they received when applying MI with their secondary students. One factor that may have contributed to this positive feeling is the effect of collegiality the PSTs experienced when planning and reflecting across subject boundaries in small groups.

The PSTs in this study experienced time and space constraints, which participants in other studies have also identified as primary concerns (Carlson et al., 2017; Dyrstad et al.,

2018; Jordan et al., 2017; Martin & Murtagh, 2017a; Quarmby et al., 2018). The problems due to lack of time for MI are especially related to the similar issues they expressed related to their own student-teaching lessons and the interdisciplinary tutoring groups' reflection meetings. Several PSTs also noted physical and logistical limitations related to the size of the teaching group.

Regaining control (Martin & Murtagh, 2017b) was not a recurring theme in this study's results, but the PSTs mentioned that it was necessary to have personal courage when applying MI, as they had to handle a certain amount of chaos in the classroom. The PSTs' focus was primarily on the didactic challenge of instructing, facilitating, and motivating transitions in from one phase to another—in this case, the transitions to and from MI, as that is a physically and emotionally activating element (Hivner et al., 2019; Webster et al., 2017). It was possible for the PSTs to perceive their supervising teachers as having high expectations and demands, thus causing the MI task to implicitly contain high demands in terms of innovation and creativity. However, the structure of the tutoring activities and the collaboration might have contributed to the PSTs' feeling that the task was not very demanding. The materials and ideas that the PSTs shared and discussed in the tutor groups were central to their learning processes. In addition, the PSTs pointed out that the existing material was mainly related to primary education. Therefore, appropriate teaching and support materials for the use of MI in secondary education is called for; teacher educators, teachers, and textbook writers all need to address this gap.

The PSTs in this study recognized that MI was important to their secondary students' effort levels. Teachers experience ongoing pressure related to students' academic performance (McMullen et al., 2016), so PSTs might be interested in ways of increasing student learning. Although, in this study, we present no specific data about students' physical activity levels, attention levels, or academic achievement, the PSTs' experiences of teaching with MI indicate

that their secondary students showed increased determination and enjoyment; the class also had enhanced learning opportunities and an improved social climate. This finding is supported by a wealth of research on how MI in primary classroom increases students' physical activity, decreases their sedentary behaviour, and contributes to their cognitive and social-emotional development (Erwin et al., 2012; Martin & Murtagh, 2017a; Norris et al., 2015; Singh et al., 2019; Watson et al., 2017). Thus, this study's findings extend the research on the positive effects of MI on primary students to also include secondary students. The potential cognitive, social, and academic benefits of MI could facilitate its implementation in secondary classrooms, as PSTs can see the positive effects that this method has on their students' outcomes. This study's results are in line with those of previous studies on MI, which has been well-received among primary teachers for similar reasons related to students' work and learning (Dinkel et al., 2017; Dyrstad et al., 2018; McMullen et al., 2016; van den Berg et al., 2017; Webster et al., 2017). Martin and Murtagh (2015) concluded that, because enhanced learning and student enjoyment have a large impact on teachers' acceptance of MI, interventions need to include a focus on these outcomes, which are also central to teacher education.

This paper offers an important contribution to the existing literature because its results demonstrate that physical education teachers are prepared to take on an expanded role by promoting physical activity in their schools. Leading scholars have pointed out that physical education teachers should also act as physical activity leaders who play a fundamental role in their schools' physical activity approaches, including MI, by organizing programmes and supporting and preparing other teachers (Carson et al., 2014; McMullen et al., 2016; Webster, Beets et al., 2015). To ensure that physical education teachers can take on expanded roles, teacher education programmes are needed to prepare preservice teachers adequately by providing them with the appropriate knowledge, skills, and experiences (Chen & Gu, 2018;

Webster & Nesbitt, 2017). Therefore, in this study, we included physical education and health PSTs as peer tutors for PSTs from other academic subjects. These peer tutors thereby received hands-on experiences of the expanded role that physical education teachers could play in MI implementation. At the beginning of the course, we also provided the peer tutors with training and an orientation on MI and their role as tutors (Cornelius et al., 2016). This preparation seems to be important; the PST tutors perceived themselves as knowledgeable, confident, and inspired in their role as MI experts. Interestingly, over time, the tutors shifted from experts to colearners of MI; this is a central feature of the constructivist learning environment (Beck & Kosnik, 2006). Consequently, this study's results show that carefully designed teacher education experiences can support an extended role for physical and health education teachers in which they become key promoters of MI in their schools.

Constructivist learning theory is this study's theoretical framework; it provided structured guidelines for pedagogical courses in teacher education (Beck & Kosnik, 2006; Rovegno & Dolly, 2006). Therefore, the PSTs were central agents in the active-learning process. The small interdisciplinary groups (five to six PSTs and one PST peer tutor) were essential to the processes of shared learning and critical reflection. The tutors' dual role as peer PSTs and MI subject experts was of central importance because, in constructivist endeavours, according to Fosnot and Perry (2005), the learners are in the centre and are involved in the learning community. Therefore, in this study, following what Hivner et al. (2019) suggested, we gave the PSTs sufficient time to discuss their experiences of implementing MI. The conditions and opportunities for learner ownership occurred in social, collegial, and subject-integrated interactions (Michael et al., 2018). Thus, the PSTs had both freedom and responsibility in their implementations of MI. This focus on learner ownership is in line with the Finnish Schools on the Move programme, which uses a bottom-up approach to give teachers and schools opportunities to come up with innovative solutions (Tammelin et

al., 2012).

The results regarding the application of MI in the LbM programme show the possibilities of creating new collaborative learning paths in subject teachers' education. The PSTs focused on subject-specific didactic theory and practiced MI with a perhaps somewhat unexpected collaboration across subject boundaries. This study's results reveal that constructivist learning principles can support subject teacher education (Beck & Kosnik, 2006; Niemi, 2002; Richardson, 1997), provided that the PSTs strive to achieve the stated learning outcomes using interdisciplinary pedagogy. The subject-integrated knowledge, skills, and competencies in this study can be described as providing a didactic opportunity within a normally sedentary professional culture. This presents a healthy challenge for all involved in education, including PSTs, tutors, teacher educators, practice supervisors, and secondary students.

5.2. Limitations and future research

Although the results of this study are promising, some limitations need to be noted. First, this study's generalisability is limited, as its results are based only on the experiences of PSTs in one teacher education programme. Studies or courses in which different individuals present and participate in the LbM programme may yield different findings. Second, although this study has high ecological validity and a cost-effective structure (as preservice teachers within a teacher education programme often lack contact time), another structure that includes more teacher resources could show other results. Furthermore, although many PSTs used MI in more than two lessons, we do not exactly know how many lessons each PST implemented. Finally, this study's results reveal how PSTs think and act in relation to MI, but it remains unclear what they will do when they actually start to teach after graduation. Therefore, longitudinal studies are needed to extend the knowledge of MI applications from the preservice phase to the practice phase. Studies of this type would inform teacher educators as

to how the educational structure can produce long-lasting effects and would help them to optimize their limited instructional time. As this study is an initial approach to study MI among PSTs, more research is also needed to provide more depth into issues that arise in this context. In addition, although physical activity and MI research often support increased student learning, there is a need for research to assess objective student outcomes also in secondary school.

5.3. Conclusion

In conclusion, this study's results indicate that the LbM programme, as a part of subject teachers' education, was successful and well-received; it improved the PSTs' attitudes toward MI and confidence in incorporating it into their academic lessons in secondary schools. The programme also effectively integrated physical activity into an existing teacher education course, providing a feasible structure for meeting both academic and physical activity outcomes within the current university context. This study's findings show that, to promote MI interventions for PSTs at the university level, there is a need to both challenge the traditional didactic teaching methods and adopt alternative pedagogical approaches that integrate MI into the teacher education curriculum. In addition, this study's findings reinforce the commonly held view that the MI method enhances the learning, social climate, and enjoyment of both primary and secondary students. The MI method can be an effective way of increasing in-school physical activity without reducing academic time. From the policy-and-practice perspective, this study meets the practical demands of subject-teacher education because it included a constructivist learning environment to support PSTs' professional development. In particular, this study's results indicate that it is beneficial to use physical education teachers as experts and to have them take a leading role in promoting MI in their schools.

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Figure 1. The use of constructivist learning principles during the three components of the LbM programme

	Socially embedded learning	Opportunity for learner ownership	Exposure to authentic situations	Active learning	Reflection	Lecturer as facilitator
University based	X			X	X	X
Peer tutor	X	X			X	
Student teaching		X	X	X	X	X

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Table 1. The thematic analysis with themes, subthemes, area of focus and quotations.

Core themes	Subthemes	Area of focus	Example of raw data	
PSTs' Work With MI	MI strategies	Small changes	It is not much you really have to do to include physical activity (Petra, T= tutor)	
		Functional teaching strategies	To stand up and get worksheets, change groups, and move around when discussing (Kati, French)	
		Linked to the academic subject	Something where you get more into the subject itself (Jonas, History)	
		Drama-based methods	You can use drama pedagogy, which I included in some lessons. (Sabina, Swedish)	
		MI implementation	Planning process	Requires some planning to maintain a 'flow' throughout the lesson (Jonas, History)
			Clear routines and instructions	Provide clear instructions and give instructions before the students start to move (Ulla, T)
			Teacher active participation	That the teacher himself is involved in the task, so that the students do not do it on their own (Camilla, Swedish)
			Noise and chaos	So you don't panic just because there a little movement and noise level goes up (Hanna, Swedish)
		PSTs' awareness of MI	Teaching facilities	It would have been better if there had not been any chairs in the room (Jonas, History)
			Range of initial attitudes	Some in the group were neutral to this task and some were negative (Ulla, T)
Increased competence and confidence	It gets easier the more you do it, so that is what you learned. (Kirsi, English)			
MI and Secondary Students	Students' experiences with MI and its benefits	Challenging and required more effort	Just that there should be so many other things in the lesson (Hanna, Swedish)	
		Students spend time sitting	It is so good that you are reminded of how much students actually sit (Saga, Swedish)	
		Student effort and learning	It can lead to better learning results and in addition the students will be able to concentrate (Pekka, T)	
		Social climate and group cohesion	Then it increases the class spirit, like this togetherness when we have been able to do something concrete together (Camilla, Swedish)	
	Recognition of various students	Students enjoyment and active participation	Mostly, it has worked well and has been received positively by the students (Hanna, Swedish)	
		Student age and development levels	It is easier to include these physical activities in lower secondary school than in upper secondary school (Ulla, T)	
		Student characteristics	It all depends on the group you have and the group's mood (Lena, T)	
A Constructivist Learning Environment	Peer tutors	Prepared and knowledgeable	That you had the initial knowledge, that you were prepared (Beata, T)	
		Change of tutor role	I have developed when they developed, because I also learned myself (Petra, T)	
		Learner ownership	PSTs have selected individual alternatives (fieldnotes)	
	Shared learning in small groups	Many MI alternatives	PSTs used a large variation of MI activities (fieldnotes)	
		Learning together	Concrete ideas from these discussions when we have shared with each other (Kati, French)	
		Group cohesiveness	This resulted in a collaboration that I can see in a classroom or in a teacher's room, which would be good in the future (Petra, T)	

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