

# Exploring the Perception and Retention of Movement Analysis Skills through Online Mastery-Based Modules

Helena Baert<sup>1\*</sup>, Larissa True<sup>2</sup>, Matthew Madden<sup>1</sup>, Erica Pratt<sup>3</sup>, & Emily Gilbert<sup>1</sup>

<sup>1</sup>Physical Education Department, State University of New York at Cortland, Cortland, New York, NY, United States

<sup>2</sup>Department of Kinesiology, New Mexico State University, Las Cruces, New Mexico, NM, United States

<sup>3</sup>Shrewsbury Public Schools, Shrewsbury, Massachusetts, MA, United States

\*Corresponding author: Helena.Baert@cortland.edu

**Abstract:** A mixed-methods study was used to determine if an online, mastery-based learning resource was successful in improving content knowledge and retention of critical elements and developmental stages of 16 fundamental movement skills (FMS); a secondary purpose was to determine participant perceptions of their experience with the online resource. Participants ( $N = 323$ ; motor development (MD) = 94; movement education (ME) = 124; elementary physical education (EPE) = 105) were Teacher Candidates (TCs) in a Physical Education Teacher Education (PETE) Program. Pre- and post-survey data, and pre-, post-, and retention test scores were used to evaluate the program's effectiveness. Paired samples t-tests indicated higher post-test scores for MD ( $\Delta 37.23$ ,  $p < .001$ ,  $d = 2.32$ ) and ME ( $\Delta 32.12$ ,  $p < .001$ ,  $d = 1.72$ ). Results from a one-way ANOVA indicated significant improvement and retention of test scores over time,  $F(3, 331) = 27.761$ ,  $p < .001$ ,  $\eta^2 = .963$ . Perceptions of PETE TCs reported positive reactions to the use of the online modules to improve their ability to analyze FMS. Based on these findings, the authors propose that implementing an online, mastery-based resource to analyze FMS may be a positive learning experience for TCs and could lead to long-term content knowledge acquisition of critical elements of FMS.

**Keywords:** *fundamental motor skills, physical education teacher education, educational resource, intrinsic mastery-learning, self-confidence*

## 1. Introduction

The importance of gross motor development in early childhood research is well-established (Epstein, 2014; NAEYC, 2009; Robinson & Randall, 2017), with fundamental movement skills (FMS) playing a crucial role in children's physical activity and health outcomes (Bolger et al., 2020; Holfelder & Schott, 2014; Spessato, Gabbard & Valentini, 2013; Robinson et al., 2018; Seefeldt, 1980; Stodden et al., 2008). These skills, categorized into locomotor (moving the body through space, i.e., skipping, jumping), manipulative (sending or receiving objects, i.e., striking, and catching), and stability (balancing skills, i.e., dynamic and static balance) movements (Gallahue, Ozmun, & Goodway, 2012; Ignico, 1994), form the basis of physical competence and set the stage for mastering complex physical activities and sports (Barnett et al., 2016; Bolger et al., 2020; Brian et al., 2020; Seefeldt, 1980). Deliberate practice of FMS by physical education specialists has shown significant improvements in youth proficiency, highlighting the importance of integrating FMS practice opportunities in early childhood and elementary physical education (Goodway & Branta, 2003; Malina, Bouchard, & Bar-Or, 2004; Morgen et al., 2013).

Despite the expectation for physical education teacher candidates (TCs) to possess knowledge and skills in motor development and learning theories (SHAPE, 2017), many face challenges in analyzing and instructing FMS effectively (DeCorby, Halas, Dixon, Wintrup, & Janzen, 2005; Lander, Barnett, Brown, & Telford, 2015; Robinson & Goodway, 2009). While PETE programs offer courses in biomechanics and motor development, the complexity of motor skill analysis can overwhelm novice instructors, as they grapple with identifying key elements, diagnosing errors, and prescribing effective interventions to enhance skill performance. Chang, Ward, & Goodway, (2020) suggest that when TCs learn the developmental stages of FMS skills, they can provide more specific feedback and deliberate tasks which can lead to FMS movement efficiency. Confidence in teaching is related to elevated levels of content knowledge and pedagogical content knowledge (Cohen, Goodway, & Lidor, 2012; Ward, 2013; Chroinin & O'Sullivan, 2016). Enhancing teacher competency in FMS includes providing TCs with content knowledge on FMS, the ability to assess and analyze movement, develop and deliver effective and developmentally appropriate instruction, and provide quality feedback. (Longmuir, et al., 2015; Martin, Rudisill, & Hastie, 2009).

Since the 1930s, scholars have advocated for integrating movement analysis skills into PETE curricula, emphasizing the use of digital video technology and feedback strategies (Heulster, 1939; Kniffin, 1985; Pinheiro, 2000; Morrison & Harrison, 1997; O'Sullivan, Stroot, Tannehill & Chou, 1989; Overdorf & Coker, 2013; Casey, Goodyear, & Armour, 2016; Zulkifli & Danis, 2022; Hattie and Timperley, 2007; Lounsbery and Coker, 2008; Knudson & Morrison, 2002). PETE programs are encouraged to align with initial standards and adopt systematic approaches to teach skill analysis effectively. However, curricular reform and the integration of qualitative skill analysis remain challenging in practice. Lounsbery and Coker (2008) suggested that to create curricular change, PETE faculty should reflect on and use the initial PETE standards as a framework for teacher education and program evaluation. Interwoven throughout the most recent initial PETE standards, a strong commitment to integrating quality movement analysis within PETE is apparent. Lounsbery and Coker (2008) also recommend that PETE programs adopt a model to teach skill analysis using a systematic approach and suggest that integrated models or resources should be offered at multiple times throughout the program so that preservice teachers can have many different experiences and opportunities for practice. The current study will outline how one PETE program has attempted a mastery-based learning approach to integrating movement analysis practice across the various years.

### 1.1. Theoretical Framework

Mastery-based learning is a pedagogical approach that emphasizes students' attainment of mastery in specific skills or concepts before progressing to more advanced content. Rooted in principles of competency-based education, mastery-based learning prioritizes individualized pacing and targeted feedback to ensure that students fully grasp foundational knowledge before moving forward (Bloom, Hastings, Madaus, 1983). This framework contrasts with traditional time-based models, where advancement is often determined by fixed time constraints rather than proficiency (Bernard et al., 2014). Central to mastery-based learning is the concept of formative assessment, which continuously monitors student progress and provides timely interventions to address gaps in understanding (Hattie & Timperley, 2007). By offering opportunities for iterative practice and remediation, mastery-based approaches empower students to take ownership of their learning and engage in deeper levels of understanding (Guskey & Bailey, 2010).

In the realm of online learning, mastery-based learning aligns seamlessly with the affordances of digital learning environments, offering opportunities for personalized, self-paced instruction (Means et al., 2013). Online learning modules, characterized by their flexibility and adaptability, provide an ideal platform for implementing mastery-based approaches, allowing students to progress through content at their own pace and receive immediate feedback (Graham, 2006). The integration of mastery-based principles into online learning modules enhances the efficacy of learning by promoting active engagement and tailored support (Rabalate, 2011). The asynchronous nature

of online learning allows students to revisit material as needed, fostering deeper understanding and long-term retention (Means et al., 2013). By offering multiple pathways to mastery and scaffolding learning experiences, online modules accommodate diverse learning styles and preferences, promoting inclusivity and accessibility (Smith & Ragan, 2005).

Maksymchuk et al. (2018) suggested that developing pedagogical mastery in future physical education teachers during professional training can be achieved through positive motivation, consistent processes, and innovative educational technologies. Kelly and Moran (2010) investigated the efficacy of a web-based program for assessing motor skills, particularly kicking. The program included feedback tutorials, guided practice, and competency-based learning options, with four focus groups: teacher-directed, web-based with and without time constraints, and no training. Results showed higher performance among the web-based groups, suggesting that web and video-based training programs could effectively support physical education TCs in learning motor skills. They highlighted advantages such as 24/7 availability, learner-paced instruction, immediate feedback, adaptability to learners' needs, and easy data tracking. While their focus was on kicking skills, the study underscores the potential of web-based training for TCs to learn a variety of FMS crucial for PK-12 student development. Recognizing the complexity of movement and the importance of understanding FMS across developmental stages, the study emphasizes the need for TCs to refine their skill analysis abilities. Consequently, the study employs a mastery-based online resource to help TCs master various FMS, catering to individual learning needs and narrowing achievement gaps among students.

In this study, the integration of mastery-based learning within online modules serves as a pedagogical framework to support student learning and achievement. By leveraging digital technology, this approach facilitates personalized instruction, adaptive feedback, and self-directed learning, thereby enhancing the online modules' effectiveness. The purpose of the study was to determine if an online, mastery-based learning resource was successful in improving content knowledge and retention of critical elements of FMS among TCs in a PETE program; a secondary purpose was to determine TC perceptions of their experience with the online resource. More specifically, this study addressed the following three research questions:

1. What are differences in pre- and post-test scores among different semesters and at various levels of the program?
2. Did TCs retain the content knowledge at a later semester in their program?
3. What are the perceptions of PETE majors regarding the mastery-based FMS modules?

## 2. Methods

### 2.1. Context and Participants

This study was conducted at a four-year pre-service PETE preparation program within the Northeastern region

of the United States. The online mastery-based program is first offered in a required motor development course (identified within this study as MD), suggested at the sophomore level (200 level). During the MD course, students study development from a lifespan approach and receive approximately two to three weeks of instruction on FMS. This course also offers a 12-hour field experience where TCs provide developmentally appropriate activities to K-6 students during an afterschool program.

Next, a movement education course (identified within this study as ME) usually taken at the junior level (300 level) implemented a retention test, followed by the online FMS program. The goal of the ME course is for TCs to gain extensive knowledge and skills in assessing, analyzing, and instructing FMS-based activities to preschool aged children. The course includes more than 15 hours of teaching physical education to children ages 3-5 years old. Finally, a third course centers around planning and instruction of K-6, elementary physical education (identified within this study as EPE). This course is offered as a capstone experience prior to student teaching and involves a 12 to 16-hour skill themes-based field experience within an elementary PE program near the university. In this course, TCs must complete a retention test and are encouraged but not required to complete the online FMS program. The data derived from 94 TCs in Motor Development (MD), 124 TCs in Movement Education (ME), and 105 TCs in Elementary PE (EPE) that completed the online “modules”. All students in these classes agreed to share their test scores for research purposes; as such, participants were considered a convenience sample.

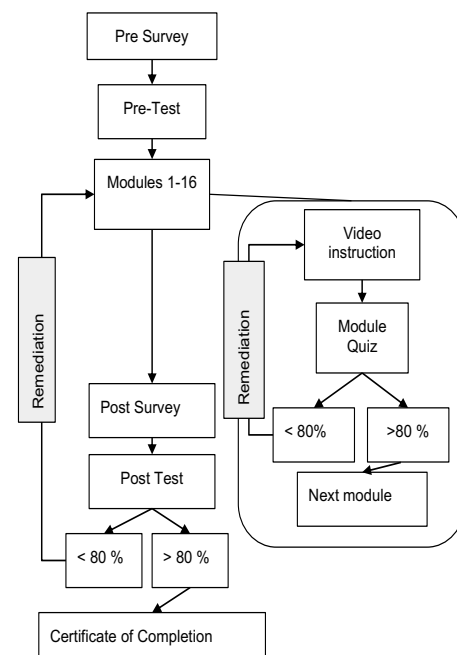
## 2.2. The Modules

The online mastery-based program consisted of 16 different skill modules. These 16 FMS can be organized in three categories: (1) locomotor skills: running, skipping, leaping, jumping, hopping, sliding, galloping; (2) manipulative skills: catching, kicking, rolling, underhand throwing, overhand throwing, striking with two hands, dribbling; and (3) stability skills: dynamic and static balance. Figure 1 represents how the 16 modules were constructed and are offered in MD and ME. When TCs start the online FMS program, they only view the pre-survey. As they worked through the entire online resource, more content was revealed based on success of the required tasks. The pre-survey consisted of a few demographic questions related to the experiences TCs had with motor development, FMS, and movement analysis. After they completed the pre-survey, the pre-test became available. The pre-test consisted of 25 questions under the following three categories:

- 1) Knowledge of critical elements of 16 FMS (Text and Multiple Choice based)
- 2) Knowledge of stages of motor development of 16 FMS (Text and Multiple Choice based)
- 3) Ability to analyze children’s FMS (Video and Multiple Choice Based)

The questions came from a test bank containing over 240 different questions (at least 15 questions per skill). The questions were selected randomly, but at least one question

and a maximum of two questions per skill were included in the test. The pre-test, post-test, and retention tests were all structured the same way with questions randomly pulled from the same FMS test bank. Following completion of the pre-test, the first module became available.



**Figure 1.** Set-up of the Movement Analysis Mastery-Based Learning Resource.

Each skill module included instructional videos that explained all critical elements of the skill as well as the characteristics at each of the three stages of motor development (as identified by Gallahue, Ozmun, & Goodway, 2012): initial, elementary, and mature stages. Consequently, each module consisted of a minimum of four instructional videos. One video showed an adult performing the skill with mature patterns and an explanation of the critical elements and teaching cues for teachers to use during their instruction. Next, videos showing each additional stage of motor development for that skill were presented. In these videos, young children (ages 2 to 12) were used to depict the correct motor skill stage. At the end of each module, a module test of five questions was offered. The questions were selected from the same test bank used for the pre-test, but all questions were specifically geared toward the skill being offered. The TCs must answer four out of the five questions correctly to gain mastery of the skill and can retake the module test as many times as they like. They are encouraged to review the videos until mastery is obtained. When 80% mastery is obtained, a new module becomes available. After completing all 16 modules successfully, the TCs received a post-survey. The post-survey asked them to rate their overall experience of taking the modules. Finally, a post-test like the pre-test was offered and contained 25 questions randomly selected from the test bank. The TCs could retake the post-test if they completed it before the due date set by their class instructor. After completing the post-test with an 80% or higher, a certificate of completion was offered to the TCs for their records.

## 2.3. Instrumentation

The 16 modules were created using the Blackboard Learning Management System. Blackboard allows instructors to use adaptive release settings to enable the mastery-based approach. For example, as students work through one module, another module will open only when students achieve 80% on a mastery test. Before and after all 16 modules, students will complete a pre/post survey and pre/post-test. The pre-, post-, and retention tests comprise 25 randomized questions where TCs analyze FMS of preschool children to demonstrate their ability to analyze movement patterns. To examine the perceptions of the TCs experience completing the modules, Likert-type survey questions and open-ended questions were employed within the pre/post survey. Inquiry focused on “how” and “why” questions that are more explanatory and help get closer to the essence of the phenomena being researched (Yin, 2009). The specific purpose of the qualitative questions was to provide an understanding and description of the TCs’ attempts to navigate, rate value, and provide feedback on the process of completing the FMS modules.

## 2.4. Data Analysis

The first research question aimed to measure the impact of the modules on the knowledge of the students within their respective classes; to do this, we measured the difference between the pre- and post-tests in MD ( $n = 94$ ) and ME ( $n = 124$ ). A series of paired sample t-tests were completed for each pair of semesters and/or levels of the program. Module scores were used as the primary dependent variable. The second research question investigated the impact of the modules on the retention of knowledge over time; MD pre-test scores, ME pre-test scores and EPE retention scores were compared. In addition, retention test scores in EPE were compared at two separate times (Spring vs Fall) to determine if retention improved over time. A one-way ANOVA with Tukey post-hoc analysis was conducted to determine if retention occurred by comparing the pre-test scores of MD and ME to the retention scores of EPE. Effect sizes were calculated for each analysis and interpreted using Cohen’s  $d$  (paired samples t-test) and partial eta squared ( $\eta^2$ ; ANOVA). Level of significance was set at  $\alpha = 0.05$  for all statistical analyses.

The third research question inquired about perceptions of PETE majors regarding the mastery-based FMS modules. For the Likert-type questions completed post-completion of the modules, an average score was calculated. For example, the question of “How would you rate the usability of the video modules?” resulted in participants responding to one of four options (e.g., not user-friendly at all to user-friendly). The open-ended essay question was analyzed using the inductive approach of thematic analysis (Boyatzis, 1998). Thematic analysis is a search for themes that emerge as being important to the description of the phenomenon (Daly, Kellehear, & Glikzman, 1997). The codes and themes were developed by reading and rereading the responses for similarities within and between groups.

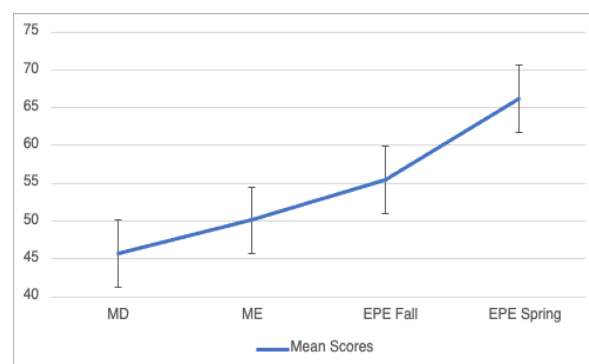
## 3. Results

### 3.1. Question 1: Pre vs Post Test scores

In general, TCs in each of the classes earned higher scores on post-tests than they did on pre-tests. There was a significant difference in the MD Pre and MD Post scores,  $t(93) = -22.547, p < .001, d = 2.32$ ; the MD post-test scores ( $m = 82.98$ ) were significantly higher than the MD pre-test scores ( $m = 45.74$ ). There was a significant difference in the ME Pre and ME Post scores,  $t(123) = -19.148, p < .001, d = 1.72$ ; the ME post-test scores ( $m = 81.61$ ) were significantly higher than the ME pre-test scores ( $m = 49.48$ ). Effect sizes for both tests indicated a large effect.

### 3.2. Question 2: Retention

A one-way ANOVA was conducted to determine if retention occurred by comparing MD and ME pre-test scores with EPE Fall and EPE Spring scores (see Figure 2). The data were analyzed to determine if there were significant differences among TCs’ scores in MD pre, ME pre, EPE (Fall) and EPE (Spring). There were four groups: MD pre ( $n = 94$ ;  $m = 45.74$ ), ME ( $n = 136$ ;  $m = 50.09$ ), EPE Fall ( $n = 42$ ;  $m = 55.43$ ), and EPE Spring ( $n = 63$ ;  $m = 66.22$ ). Data were normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ), and there was homogeneity of variances, as assessed by Levene’s test of homogeneity of variances ( $p = .159$ ). Scores among the four fundamental movement patterns groups were statistically significantly different,  $F(3, 331) = 27.761, p < .001, \eta^2 = .963$ . Partial eta squared indicated a large effect size. Tukey post-hoc analysis indicated no significant differences between MD pre and ME pre-scores ( $p = .113$ ). There were, however, significant differences between MD pre and EPE (Fall) that favored EPE Fall ( $M$ difference = 9.68,  $p < .001$ ); there were significant differences between MD pre and EPE (Spring) that favored EPE Spring ( $M$ difference = 20.48,  $p < .001$ ); likewise there were significant differences between ME pre and EPE (Fall) that favored EPE Fall ( $M$ difference = 5.34,  $p < .05$ ); there were significant differences between ME pre and EPE (Spring) that favored EPE Spring ( $M$ difference = 16.13,  $p < .001$ ).



**Figure 2.** Mean pre/retention scores between three courses: MD, ME, and EPE.

**Table 1.** Teacher candidates' perceptions of using the mastery-based FMS program.

<i>How useful/useless did you find the video modules in enhancing your knowledge about fundamental movement patterns?</i>		
	<b>%MD</b>	<b>%ME</b>
Useless	7.78	0
Somewhat useless	1.01	9.05
Somewhat useful	33.2	29.95
Useful	58.88	61.01
Unanswered	9.9	0
<i>How would you rate the usability of the video modules?</i>		
	<b>%MD</b>	<b>%ME</b>
Not user-friendly at all	0	0
Not user-friendly	2.44	1.97
Somewhat user-friendly	43.83	34.37
User friendly	49.28	63.56
Unanswered	12.7	0
<i>Do you agree that these modules are helpful as an online supplement within the physical education teacher education experience?</i>		
	<b>%MD</b>	<b>%ME</b>
Strongly Disagree	0	0
Disagree	2.63	3.66
Neither disagree nor agree	5.55	9.99
Agree	43.47	51.19
Strongly Agree	43.91	35.16
Unanswered	10.84	0

*Note.* MD = Motor Development, ME = Movement Education

Lastly, the Tukey post-hoc analysis indicated significant differences between EPE (Fall) and EPE (Spring) that favored the Spring class scores ( $M_{\text{difference}} = 10.79$ ,  $p < .001$ ).

### 3.3. Question 3: Perceptions

The third research question inquired about the perceptions of PETE TCs regarding their use of mastery-based FMS modules. The Likert-type scale results indicated that the online mastery-based FMS program was a positive, effective, and useful experience (see Table 1). The open-ended question responses resulted in two themes. First, most TCs agreed the modules were helpful as evidenced by their survey response and supported by their typed response. Typical responses included "I have no suggestions," "none", or "no suggestions." A few TCs expanded their responses. For example, one TC stated, "The videos were very helpful and easy to understand which made answering the questions easier. You could see what stages were happening in each video because they were clearly defined." Even though this quote suggests "clearly defined" understanding of stages, the next theme was contradictory to this notion.

Second, TCs provided feedback explaining that because there are so many complexities and specifics for each stage of movement, it was difficult to differentiate between the stages of development. A representative response to this theme from one TCs was:

*"My only suggestion to help enhance my experience in this class would be to use adults doing motor skills at each level because it was difficult to tell some movements from others because they were so similar. Otherwise, I thought the modules were very helpful."*

The statement supports the reality that analyzing movement in real time is difficult and more than a few attempts must be available. Overall, the TCs perceived the modules as needing little change but should focus more on the intentional differentiation of the developmental stages. The following statement combines both themes:

*"I thought the videos were very effective. I thought that the modules were very helpful in learning the stages. The videos helped me relate the locomotor and manipulative charts to the skill in real time. It was a challenge to recognize the difference between certain skills that had multiple elementary levels. I feel that the elementary levels are difficult to remember because they are similar. Watching the students perform the skill will benefit me...I wish I had access to this in the future to study."*

## 4. Discussion

The results of the study provide valuable insights into the effectiveness of mastery-based FMS modules in PETE programs.

The significant increase in post-test scores compared to pre-test scores indicates a positive impact of the intervention on the learning outcomes of TCs. The effect sizes for both MD and ME classes were large, suggesting substantial improvements in understanding and mastery of fundamental movement patterns. The mastery-based approach used within the modules may have been a contributing factor to the increase in test scores.

The retention analysis revealed significant differences between pre-test scores and scores in the fall and spring periods, demonstrating that TCs retained knowledge gained from the intervention over time. The large effect size

indicates a robust retention effect, highlighting the sustained benefits of the mastery-based FMS program. The results showed that as TCs progressed through their coursework, their retention increased. The pre-test scores increased significantly between the ME and EPE courses, and the retention scores increased significantly between the EPE Fall course and the one offered the following Spring. This may be related to the fact that more students in the Spring EPE course took the ME course since the ME course became a required course. Consequently, most students enrolled in EPE in Fall had only taken MD, not ME.

With the inclusion of the ME course, it is expected that all students in EPE will have taken MD and ME, which means they will have benefited from the modules and the hands-on field work in both classes. Both experiences should have a positive influence on their ability to analyze FMS. The results indicated that including various opportunities to practice movement analysis is quite important and may lead to greater retention. The average pre-test score in MD was 46%, in ME it was 50% and in EPE it was 55% for Fall and 68% for Spring. While the retention scores improved, they remain fairly low. Given an average increase of 15% with the inclusion of the ME experiences (both the modules and the field experiences), we can deduce that more practice opportunities in assessing, analyzing, and instructing FMS can enhance TCs' overall movement analysis knowledge.

The results reflect an increase in retention when incorporating a systematic approach of integrating movement analysis across the curriculum, a recommendation made by Lounsbery and Coker (2008). Similarly to Lounsbery and Coker (2008), this study shows that different opportunities for practicing movement analysis are necessary. While TCs are now provided multiple learning opportunities throughout the program to enhance their knowledge and skills related to analyzing FMS, further research to track the progress of knowledge and skills in movement analysis of FMS will be important.

The perceptions of TCs regarding the FMS modules were generally positive. The majority found the modules useful and user-friendly, indicating their effectiveness as an online supplement within the PETE experience. However, TCs expressed a need for better differentiation of developmental stages within the modules. They found it challenging to distinguish between similar movement patterns, suggesting opportunities for improvement in instructional design. The feedback received from TCs indicated difficulties in identifying the various stages of motor development that young children often display. These findings support the idea that the qualitative nature of movement is often difficult to identify within the laboratory setting (Knudson & Morrison, 2002). Zulkifli and Danis (2022) emphasized the importance of content knowledge for teachers to effectively provide feedback on movement and learning as crucial. To build content knowledge in movement, analyzing movement through video can provide practice in observing and studying the critical elements of movements representing each developmental stage. It should be noted that the performers in authentic settings may also display other characteristics representative of their cognitive learning stage (e.g., thinking through the movement) which are not necessarily

observed on a video (Knudson & Morrison, 2002). Authentic experiences provide a blend of biomechanical and motor behavior information allowing for a more complete display of movement (Overdorf & Coker, 2013).

These findings have several implications for the design and implementation of PETE programs. Firstly, the study underscores the effectiveness of mastery-based approaches in enhancing TCs' understanding and application of fundamental movement patterns. Integrating such programs into PETE curricula can better prepare future physical education teachers to teach these skills effectively. On average, students completing some or all coursework online can increase their performance more so than students who are doing all their work in traditional classrooms (U.S. Department of Education, 2010). Secondly, the identified need for improved differentiation within the modules highlights the importance of ongoing refinement and adaptation of instructional materials based on feedback from stakeholders. Addressing this need can enhance the utility and effectiveness of the modules in supporting TCs' learning. Thirdly, like the findings of previous studies, the finding of this study confirms and supports the need for practicing movement analysis both using a video-based supplement and an authentic environment with young children (Knudson & Morrison, 2002; Lounsbery & Coker, 2008; Overdorf & Coker, 2013; Zulkifli & Danis, 2022). Given that all courses included in this study contain field experiences with children, it is key to explore and investigate video and authentic movement analysis practices.

Demographic characteristics, such as region, neighborhood poverty level, and prior education, strongly predict online learning outcomes, with their influence varying over time and between different courses (Rizvi, Rienties, & Khoja, 2019). Consequently, recommendations for future research would include controlling for potential moderating factors such as: instructor variation, age, prior academic performance, online learning experience, and generalizability across different PETE institutions. Additionally, longitudinal studies could provide further insights into the long-term impact of mastery-based FMS programs on teaching practices and student outcomes.

## 5. Conclusion

Given the upward trend of the increasing module test scores in the PETE program, an increase in knowledge related to movement analysis skills among TCs can be implied. The use of online mastery-based FMS modules could lead to greater competency in movement analysis among TCs. In the future, evaluations of the effectiveness of the modules across time as well as their impact on authentic settings should be explored. While the results indicated positive effects for PETE TCs, the modules could be expanded and offered to students in different PETE programs or related fields. The development of quality resources aiming to enhance movement analysis skills in PETE is extremely beneficial yet time consuming; therefore, a collaborative approach may be needed (Williams, 1998). Open educational resources may provide another approach for PETE programs and other individuals



interested in implementing a movement analysis program to supplement learning (Goldberg & LaMagna, 2012).

The outcomes of this research study, coupled with the extensive scope of the project, underscore the imperative to establish a robust, accessible, and cost-free repository of resources dedicated to supporting physical education teachers and professionals in early childhood-related fields. Recognizing the significance of providing mastery-oriented practice opportunities in the analysis of fundamental movement skills, disseminating this resource as open access holds the potential to deliver targeted and supplementary professional development to educators and practitioners alike. Lastly, supplying educators with such experiences through professional development programs would empower them to cultivate the requisite knowledge and skills essential for delivering developmentally appropriate feedback, thereby nurturing children's proficiency in motor skills.

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