

# **Improving motor skills in short running and learning motivation as part of the implementation of a hybrid curriculum (ICT based) among physical education students**

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## **Abstract**

**Background:** Cutting edge research based on the use of information and communications technology (ICT) approaches in physical education (PE) to study their influence on educational curriculum has been performed in two similar groups of participants. In this regard, it is of interest to compare the impact of three educational programs in similar groups of PE students studying at the Academic College of Education in Israel.

**Methods:** Students studied sprint running as part of their athletics lessons over nine weeks once a week following the same basic program. For the last two lessons, group A (n=14) continued to study the basic program, while groups B (n=17) and C (n=23) took part in the interventional photography and hybrid programs, respectively. The measure of the 60-meter run for all of the groups was in lesson nine under the same conditions. All of the students were asked to perform another run to improve their results.

**Results:** The running results in the second sprint were improved by 40% in students in group C compared with students in groups A and B. The motivation to learn was 12.7% higher in group C compared with group A and 37.3% higher than in group B. Only 0.84% of the students in group B improved their running results compared with group A. Motivation for learning was 25.63% higher in students in group A compared with students in group B.

**Conclusions:** The hybrid program was adapted to the PE students to use all known didactic teaching methods in the shortest possible time in the process of studying the main program using ICT approaches.

Learning motivation and sprint running results were improved in the hybrid program, which could be partly attributed to online studying. The photography program did not lead to a noticeable improvement in sprint running results and learning motivation.

**Keywords:** ICT, athletics, curriculum, students, physical education

## **Introduction**

Information and communications technology (ICT) is part of young people's lives (Goodyear, 2017). All formal education students in Israel (schools, universities, and colleges) use smartphones. Employees of the Ministry of Education of Israel communicate with teachers, lecturers, students, pupils, and parents by mail, WhatsApp, Zoom, smartschool, Moodle, and different Google programs. All education institutions in Israel have used ICT approaches for online studying and homeschooling during the coronavirus disease 2019 (COVID-19) pandemic (Ziv, 2021).

According to the curricula of the Ministry of Education of Israel, physical education teachers must master 12 athletic disciplines (Lidor, 2007) for 48 hours of college tuition over 24 lessons. The strict time frame allocated for mastering athletic disciplines requires a different way of learning. The introduction of ICT approaches into the education process of physical education students could be a necessary part of the communication and means of implementing students' studies. However, in the educational process, it is necessary to include all didactical methodologies (Henriksen, 2016). Accordingly, the experience of using ICT for physical education students worldwide is interesting.

Studies on adapting curricula to physical education teachers have been conducted worldwide (Kim, 2015). Some studies have examined the impact of the technological learning environment on increasing the learning motivation of students (Nissim, 2016; Hirsh, 2018); and ways to improve athletic movement skills (Farrow, 2002; Aglioti, 2008). Additionally, measuring activity in the brain while participants watch movies about basketball has demonstrated that there is high activity in the mirror neurons in the movement centers of the brain. These studies have provided the basis for examining the effect of learners videotaping to improve their performance (Laughlin, 2019). Scientists have examined different ways of improving proper demonstration ability among physical education teachers, and proper demonstration of

students is of great importance as part of the learning process and acquisition of performance techniques in all sports (Ward, 2021).

However, the level of movement and the level of physical fitness of first- and second-year students at the beginning of their studies have not enabled promoting their didactic abilities (Shubik, 2002).

## **Methods**

### ***Study design and ethical considerations***

This quantitative study involved three groups of first- and second-year students taking an athletic course as part of a physical education teacher training program. The findings of the study were based on results in practical exams when a comparison was made between the improvements in the results within the study group by two repeated tests in the same field.

The study population consisted of female students aged 20-40 years old studying in the physical education teaching major at the Academic College of Education in Israel. The study included 61 participants who signed a participant consent form, and the study was conducted according to the principles of the Declaration of Helsinki. The questionnaires for students participating in the study were approved by the ethics committee, according to the principles expressed in the Declaration of Helsinki.

Three groups of students (Groups A, B and C) studying the physical education teaching major at the Academic College of Education (Israel) participated in the study. The students were randomly divided into the groups by college administration. Depending on the curriculum and the number of semester hours, each athletic discipline has two practical lessons over two academic hours, which includes a practical examination and improvement performance of personal skills. Students in all the groups studied once a week on the same day of the week, and had the same training place, equipment (stoppers, protocols for the list of running results), number of lessons that preceded the exam, and teachers that measured and recorded the results.

Each of the three groups had a different curriculum. The effects of the various curricula on the results of a 60-meter run in the students were examined in this study, and the reasons for their improvement were clarified.

The duration of the study was nine weeks and the groups' studies took place after the COVID-19 semester, when most of the practical courses were taught using Zoom. The semester exams were also held

via Zoom, which resulted in inactivity among the students and a decrease in their physical fitness. It is critical that the physical fitness of the students is high, which allows students to learn athletic disciplines at a high motor-practical level. Low physical fitness leads to inaccurate motor technical performance and, as a result, achievements in practical exams are low and do not reflect the potential ability of the learners. The nature of the students studying in the physical education field is competitive; they reach the stage of measuring academic achievement in each athletic skill, and the enthusiasm of the participants in the measurements increased due to metric measurement (measurement is accurate: Run in seconds and minutes; jumps, shots, and priority in meters and centimeters), which increases their motivation for achievements every time. The desire to reach high achievements to the limit, without the basis of physical fitness, can cause physical injuries (sports trauma). Therefore, measurements were not made at the beginning of the semester of running 60 meters, so as not to cause injuries (sports traumas) in the students.

### ***Participants***

Group A consisted of 17 female students in the second year of study aged 20-28 years old, and one student that was 40 years old. All participants agreed to participate in the study. In total, 14 students participated in the practical program (one female student was not active in the class due to pregnancy, and two students were in quarantine).

Group B consisted of 18 female students in the second year of study aged 21-31 years old, and two students who were 40-41 years old. Only 17 agreed to participate in the study (one student was in quarantine).

Group C consisted of 29 female students in the first year of study aged 19-28 years old. All participants agreed to participate in the study. A total of 23 students mastering a practical program were included (three female students were not active in the class due to pregnancy, and three students were in quarantine).

### ***Interventions – curricula description***

#### *Overview*

The three groups of students participated in three different curricula: the basic curriculum (participants of group A: 17 learners + one pregnant student), the photography curriculum (participants of group B, 18 students), and the hybrid curriculum (participants of group C: 26 learners + three pregnant students).

Curricula B and C were intervention programs performed during the students' studies as part of the physical education teacher training program. Measurements of achievement in athletics were measured individually because the number of students was high in some groups, up to 32 students, and the waiting time was long; so, the idea arose to take advantage of the waiting time for studies.

Therefore, part of the implementation of the hybrid curriculum (C) and photography curriculum (B) was conducted while waiting between trials, with participants in the achievement measurement continuing to learn and teach their friends in small groups. The group selected for the implementation of the hybrid curriculum was the largest group (group C) and included 26 students.

The 60-meter running measurements, recorded protocols, and pedagogical observations were performed by a lecturer in athletics and two physical education teachers with over 35 years of teaching experience in physical education in schools in Israel.

#### *Group A – basic curriculum*

Group A studied the basic curriculum throughout the semester, including measurement periods when the measurements were individual. The most basic teaching method was the teaching of the athletics disciplines in schools, divided into teaching units of three to four lessons, in which the students acquired basic skills of the discipline. This is a teaching method in which physical education students learn. Before the COVID-19 pandemic, most of the learning took place practically in an athletics stadium, while acquiring the technique of performing athletic disciplines according to the accepted methodology, which includes breaking down the skill components into parts, learning each component, and gradually connecting the components while correcting mistakes and customizing the technique. This is the accepted basic method in teaching the athletic disciplines, and through it the physical education students are taught the physical education instruction. More precisely, the instruction is conducted while demonstrating with an explanation. During the COVID-19 period (in the semester preceding these assessments), academic material was written on the college website and available for students to study at any time. The theoretical material written in the Hebrew language - material that includes a description of skills, preparatory exercises, and specific exercises written in the order relevant to studies in all athletic disciplines taught in the education system of the State of Israel. Students were asked to study the theoretical material and watch videos of the world's greatest athletes displayed on YouTube by topic to progress in the practical material.

#### *Group A exam*

During the exam, group A measured a 60-meter run, and subsequently, the students were asked to perform another run to improve their results. The lecturer and teachers, who measured and recorded the exam results, incorporated constructive notes to correct and improve their running technique.

#### *Group B – photography curriculum*

Group B studied the basic curriculum most of the time in the field. In the class that preceded the 60-meter dash exam, the students were divided into groups on WhatsApp (four to five per group). They then photographed their friends and were later asked to self-study at home to compare their running technique with the international athlete running technique in short runs. They were asked to watch the relevant videos on YouTube to properly perform the tasks at home.

#### *Group B exam*

During the exams of group B, students were asked to photograph their first competitive run when the team composition was according to the groups determined in the previous lesson in WhatsApp. After the first run and comments from the lecturer and the two teachers measuring the results to improve the running performance style, the students were asked to watch videos taken on the first attempt of the run, provide each other with feedback on correcting mistakes in the technique, and perform the run again.

#### *Group C – hybrid curriculum*

Group C studied the basic curriculum most of the time in the field. They were divided into WhatsApp groups and videotaped their teammates in a pre-measurement class, like group B.

Learners were asked by the lecturer to watch YouTube videos and compare their running technique with the running technique of other athletes who appeared in the videos. In addition, their WhatsApp groups received electronic viewing forms from Google forms describing short-running techniques (a total of four forms). The forms included a description of correct and incorrect running techniques. Students were asked to fill in the viewing forms as part of their and their friends' running style analysis. After filling in the forms, a numerical score was obtained for performing the running technique, and a copy of the form was sent to the lecturer and student.

#### *Group C exam*

During the exam of the 60-meter run, the students in groups C - received the following instructions: They were asked to use new electronic viewing forms (Google forms) identical to the forms they received at the end of the previous lesson they filled in at home. Before performing the first competitive run, the students

were instructed on how to fill in the digital forms for viewing, because some of them did not know how to work with the forms.

At the request of the learners, the lecturer repeated the material learned on the subject of the components of the running technique. Emphasis was placed on the specific exercises that correct the common running errors of the students discovered via filling in the forms at home as part of the preparation for the running test.

The lecturer's explanation was short because the students who filled in the forms at home already understood how to do it. It was explained to the students at the beginning of the lesson that in this exam they compete not only individually, as in the other exams in athletics, but also in small groups.

In addition, the roles that each of the students in the group were assigned were as follows: competitor, starter, assistant starter, photographer, and measurer of the results using a stopwatch. Each participant in the small groups was required to experience all of the following roles: A 60-meter dash competitor, athletics judge, filling in four different electronic viewing forms showing four skill components (start, acceleration, running at maximum speed on the track, finish line attack) while explaining the mistakes in running to their friends, filming the video, and providing them feedback on correcting their mistakes in the running technique of the discipline. At the end of the lesson, the winning group was the one that improved the group time of the run while comparing the first group result to the second group result. The results of the group competition were later published in a shared WhatsApp for the whole group.

### ***Rationale for including the 60-meter run measurement***

Running 60 meters is an independent athletic sport. Short running is the basis for all athletic disciplines taught in the physical education teacher training program (e.g., long jump, high jump, long shot, relay running, and hurdles) and other sports. Students of the three groups participating in the study learned specific exercises for developing running speed in all classes that preceded the 60-meter running test. Before the exam, for eight weeks of study, specific running exercises were learned at the beginning of all classes designed to develop speed and running style and were performed before studying the other athletic disciplines. A high running speed allows a more correct technique, leading to better results.

The 60-meter run tested by the students is the shortest run in which achievements are measured on a global scale. Improving world records in this field is rarer than running 100 meters because of the shorter distance. Therefore, in the competitive measurement, reference was not in a few seconds or hundredths of a second; an improvement was made in these students (study participants) considering the number of runners (students) who were able to improve the result of the run. The ways the measurements were

conducted in this study were also different: Measurements of the first and second run took place at the same rate when the time between attempts was 10-15 minutes. This is in contrast to other studies that have examined improvement in outcomes after a period of influence of the workout program or exercises that influence change. Students were already trained to improve short running for eight weeks without a 60-meter running test at the beginning of the study period (to maintain their health because of their low physical fitness at the beginning of the semester). Accordingly, they came to the exam at the peak of physical ability that could be acquired during this period. The time between attempts was short and no motor activity could be performed, which could considerably affect the results of the re-run. Therefore, the improvement in the running results was influenced by a change in the running technique (improvement of motor skills) and the motivation of the learners, measured according to the number of learners who performed the measurement again. Immediate improvement in runners' results was explained by the effect of the hybrid curriculum developed during the COVID-19 period.

### *Data analysis*

Data analysis (protocols with practical exam results of a 60-meter run) based in the viewing of expert teachers in the field of physical education and mathematical analysis of the running results (Run.xlsx).

### **Results**

The various curricula that the students studied influenced the results of the study of the 60-meter run. The hybrid teaching method of group C improved the practical results of running at a higher level than teaching methods A (basic) and B (photography method). In the hybrid learning method, there was an improvement in the repetitive running results measured in the learners of group C as a result of improved motor performance and higher motivation. As noted by the lecturer and the two teachers who participated in the measurements of the running results in the summary and by their pedagogical observation performed in all groups, most of the students of group C improved the running result in the 60-meter run. Furthermore, compared to group C, only approximately one-third of the students improved their results in groups A and B. In groups A and B, there were fewer learners, and they received a personal response from the lecturer and teachers regarding the errors observed in their performance of the short running technique and recommendations for correcting their mistakes in running, compared to students in group C who received no explanations for their mistakes and corrections between the two measurements. Group C performed the highest re-runs, which indicated that they had the highest motivation to study and improve (Table 1).

Table 1

Students	Group	Group	Group
	A	B	C
<b>in the experiment (n)</b>	14	17	23
<b>improved their results (%)</b>	28.57%	29.41%	69.56%
<b>made additional attempts (%)</b>	78.57%	52.94%	91.30%

## Discussion

Worldwide, studies on fitting curricula to physical education teachers have examined ways to improve various sports skills and focused on the importance of proper demonstration to students as part of the learning process in acquiring a performance technique in the sports field (Ward, 2018). In sports, there are quantitative studies that measure the improvement of motor skills (Chagas, 2017) by examining the level of performance of the learning groups at the beginning and end of the study period. In this way, the changes in the results of the learners' performance are examined under the influence of the new teaching method, which usually lasts approximately six weeks (Wilke, 2019). The present study examined the effect of the curriculum that was mostly taught between two 60-meter runs, with a waiting time between 10 and 15 minutes. During this time, students studied the practical part of the hybrid curriculum, and as a result, learners progressed by 40% more compared with other teaching methods used in the two control groups (basic Group A and photography Group B).

It is important to start the lesson by summarizing the material learned in the previous lesson, which is more effective and affects the performance of learners during the lesson (Aljadeff-Aebergl, 2017). Moreover, in this study the learners were asked to perform homework in preparation for the measurement lesson, which not only stimulated the learners' memory and developed their analytical abilities, but also provided a statistical measure of the learners' running technique that allowed the lecturer to provide verbal guidance and specific exercises to correct common mistakes.

According to Henriksen (2016), the teaching procedure in physical education is based on observation; patterning ability to identify by observation abstract-deduction, kinesthetic thinking or understanding of motor emotion, (modeling) creating a model based on an existing model, play, and synthesizing. It also includes presenting images and videos of the related athletic field that is being studied, as claimed by

Yang (2014) and Greve (2022), which shortens the initial learning process of observing, abstracting, and patterning for physical education students.

However, Madou (2018) claimed that using only video photography did not significantly improve the motor performance of learners, which was consistent with the results of the present study. Most group B students were unable to improve the results of their second run when they only used a model video to compare against their own videos. Unlike group B, the students of group C in the present study, in addition to photography, used other teaching aids, as other researchers did.

When using viewing cards in which movement components are recorded to detect mistakes in the movement of learners as part of the process of dismantling the components of the sports industry using video capture, imitation and execution of movement in the correct technique, these steps are called synthesis. In the present study, the students used electronic viewing cards at home before and during class.

Activities in small groups challenge students according to the studies of Isebryt (2018) and Ward (2018) and increase motivation to study owing to receiving immediate positive feedback from their group members after improving technical performance. Salomon noted that peer learning through “role-playing” (Clancy, 2006; Salmon, 2016) is challenging, light-hearted, and is considered a very effective form of learning, even according to Ayvazo (2010).

Casey (2018) found a problem in athletics studies of small groups using the written cards with the technical components of the field: The pace of learners' progress was slow, students sought mediation from the teacher, and he was forced to intervene in their research study. The current study also required a rapid pace of progress in the material studied. First-year students begin teaching experience in schools and are committed to mastering the six branches of athletics according to the curriculum (Lidor, 2007) of the Ministry of Education (in Israel).

Second-year students are required to have good knowledge of six additional athletic disciplines to teach in middle school and high school. It is important to adhere to safety lessons. The hybrid curriculum is best suited for studies at academic colleges of education in Israel because the teacher initially teaches the basics, and the students continue to study in the "student-student" program.

Students with families have difficulty attending all classes; thus, learning in small groups on WhatsApp allows them to continue the learning process using videos and electronic viewing forms on the topics being studied. Anyone unable to attend a class at the stadium can acquire all the roles of a physical education teacher with the help of technology integration.

The students performed up to three trials in the athletic short run, in which research measurements (running) were conducted, while during the process of physical performance, the didactic knowledge required by physical education teachers was consciously built into them. Following the results of the pedagogical observation (practical examinations), a professional study method in athletics at the Academic College of Education, it was clarified that the accepted approach of using the means and teaching methods in basic athletics group A and video photography group B were not sufficiently effective because not enough time can be allocated to acquire the professional skills required to internalize students' topics.

## **Conclusions**

The hybrid learning method contributed more to the development of traits fundamental for the teacher: i) Improved demonstration ability; ii) higher motivation for studies and iii) motivation to achieve more professionally (compared to group B) of those who studied in small groups.

Unlike other techniques, in a hybrid learning method, physical development is performed during the complex process of applying educational technologies. In the future, physical education teachers will have the opportunity to solve the functional problems of a physical education teacher in the earliest process of their studies and cultivate their athletic qualities while studying the roles of teachers and judges.

The methodology allows:

1. Simulation of professional functioning conditions based on work in small groups.
2. Monitoring and mirroring the development of educational and professional motivation and awareness of the significance of the professional development process.
3. Using modern ICT approaches, videos, web, WhatsApp, and Google format forms (enabling studies for control and quality assessment), motor skills, and professional links of the physical education teacher. In this way, the environment is preserved.
4. Establishing habits of using practicing methodological techniques in preparation for teaching experience.
5. Identifying mistakes in performance techniques using electronic viewing pages that show all the elements of the style (including a specification of correct and incorrect body movements).

6. Detection of errors in the execution technique during the preliminary stage of the exam (as a task to perform at home), when students watched their and their friends' running technique, which was filmed in the pre-measurement lesson, combined with filling in Google Forms.
7. Giving a numerical score by an electronic viewing form (Google Forms) resulted in improved running performance in the students.
8. Students were asked to find different ways by correcting performance errors as part of the learning process.
9. The teaching methodology in the athletics field was based on up-to-date material written in Hebrew, which included a description of performance styles and preparatory and specific exercises, which were presented in the order relevant to the studies. The theoretical material is found on the college website and is available for distance learning. Students also used it in practical lessons (in the stadium).
10. The lecturer observed the level of progress of the students at each stage (according to the statistics of the Google forms) and responded to the common mistakes of the learners by further explanations, additional demonstrations, preparatory exercises, and more specific to correct them, which increased the motivation of the learners.
11. Simulation of roles - Physical education teachers should master an "industrial game" (athletics competition) that encourages students not only to improve the practical results of their running, but also to learn the qualities required of teachers.

These innovations in the new methodology generate creative motivation and curiosity for students' scientific research activities, improving personal responsibility for the results of joint group activities and individual activities through methods of rating group and individual results done simultaneously and announcing, reporting, and presentations on topics studied. Considering the strict standard of study hours regarding the athletics disciplines and the lack of personal relationships between lecturers and students, the increasing intensity of educational-pedagogical impact was made on the basis of continuous activity in building professional abilities of teachers during the practical study. Personal characteristics and conditions of independent work were taken into account.

In the group that worked following a hybrid program in a measurement class, the participants reached the stage of improving personal style. Furthermore, while in the process of learning a competitive method in the athletics disciplines, the students performed the following roles:

1. Athletics referee.
2. Appreciator of the technique of performing a style of athletics.
3. Participant in an individual competition.
4. Participant in a group competition - simultaneously.

In the process of simulating the application conditions and potential professional functions, a learner organization was used in small groups (four to five students per group), where learners could compete with each other individually according to the "Constitution of Athletics" and in the group competition at the same time.

As each of the participants in a small group came to perform a competitive experience, the other members of the group served in the positions of "judges of athletics" (e.g., secretary, announcer, starter, and surveyor) in the athletics competition.

In competitive stage learning, each of the participants in a small group served as judges, filled in forms for their teammates who made competitive attempts, and marked whether each of the four components of the technique were incorrect or correct.

By performing refereeing roles, students acquired the following skills: Comparing the performance style with the model style (sprinter), the ability to determine mistakes in performance style skills, the ability to determine the relationship between incorrect performance and their results, knowledge of stopwatch measurement methods in athletics, and the ability to provide relevant methodological instructions. While performing starter roles, starter assistant, and announcer in the competition, the students of the hybrid group acquired and used active and organizational communication skills on the one hand, and on the other hand acquired didactic skills: Filming a video for performing experiments. The video served as an objective source of information for error detection and served as a basis for analyzing the effectiveness of the style and correcting its slider.

## **Data availability**

### *Underlying data*

Run.xlsx (Graph display of groups A, B and C),

[https://docs.google.com/spreadsheets/d/1Uw19S\\_fS4-6xTAXCngQH8Y-S2hsHfnjf/edit?usp=sharing&oid=108063352782718469359&rtpof=true&sd=true](https://docs.google.com/spreadsheets/d/1Uw19S_fS4-6xTAXCngQH8Y-S2hsHfnjf/edit?usp=sharing&oid=108063352782718469359&rtpof=true&sd=true)

(Soo, 2021a).

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