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An interprofessional education program based on the ARCS-V motivation model on the theme of "Chronic Disease Management and Patient Safety": action research

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Abstract

Aim The aim of the study was to develop and implement an interprofessional education (IPE) program that would enhance healthcare students' learning by motivating them with a theme.

Methods The study, conducted at a university (enrolled in three faculties of health sciences dentistry, and medicine) in Turkey between 2019 and 2022, was designed as action research and followed six stages: Deciding on the Area of Focus, Reconnaissance, Planning, Acting, Evaluation, and Monitoring, utilizing both qualitative and quantitative data for program development based on the ARCS-V (Attention, Relevance, Confidence, Satisfaction, and Volition) Motivation Model and ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instructional design model. The program was based on the ARCS-V motivational design model, included three sessions and, was hybrid. Tactics and strategies from the motivational model were used throughout the online and face-to-face training process. RIPLS (Readiness for Interprofessional Learning Scale) and ARCS-V measurement tools were used to measure the effectiveness of the training program. RIPLS was used as a pre-and post-test.

The ARCS-V motivation scale was used at the end of the training. IPE Student Success Evaluation Form (SSEF) developed by researchers consists of seven sub-dimensions. The maximum score on the scale is 33. Data were analyzed using the Chi-Square test, Independent test, Wilcoxon rank test, Mann-Whitney U test, and one-way analysis of variance.

Results The IPE program titled Chronic Disease Management and Patient Safety was implemented as a hybrid, and 25 students participated. The RIPLS showed statistically significant increases in total scores (p= 0.00), Additionally, the ARCS-V scales revealed high levels of motivation, with average scores of 4.70 ± 0.35 for the Instructional Materials Motivation Survey (IMMS), 4.53 ± 0.40 for the Course Interest Survey (CIS), and 4.48 ± 0.48 for the Volition For Learning Scale (VFLS). It was found that the scenarios, multimedia elements, messages, e-mails, reflection assignments, and group tasks embedded in the learning content increased students' motivation and interest. According to the IPE-SSEF, all students were successful and passed the 60% limit.

Conclusion The present study offers universities an IPE program themed on "Chronic Disease Management and Patient Safety". This program design can be used for training healthcare professionals who can build strong

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relationships with patients, are able to define needs, and are competent in interprofessional communication, collaborative leadership, teamwork, ethics, roles responsibilities, and lifelong learning.

Keywords Medical education, Interprofessional education, Health professionals, ADDIE instructional design, ARCS-V motivational model, Action research

Introduction

The evolving complexity of healthcare necessitates seamless interprofessional collaboration to enhance patient safety and care quality. Despite technological advancements, communication breakdowns and role ambiguities among healthcare professionals often result in medical errors and inefficiencies [1–3]. To address these challenges, the World Health Organization (WHO) emphasizes interprofessional education (IPE) as a strategy to foster teamwork and collaboration among healthcare workers [4, 5]. IPE enables students to learn with, from, and about each other, fostering skills in communication, teamwork, and role understanding early in their education, ultimately improving healthcare outcomes [6–8].

Recent research underscores the importance of motivation in promoting effective interprofessional collaboration, improving students' ability to retain knowledge and apply skills in clinical practice [7–9]. Student motivation impacts both the quality of the learning process and the development of long-term collaboration skills [10]. Specifically, Keller's ARCS Motivation Model (Attention, Relevance, Confidence, Satisfaction) provides an effective framework for systematically implementing motivational strategies in learning design [11]. The use of engaging video simulations, real-world scenarios, interactive games, attention-grabbing visuals, and open-ended questions increases students'attention, encouraging their active participation in the learning process. [10, 12–14]. Despite its potential, limited research exists on applying motivational frameworks like ARCS-V to IPE programs [6, 15]. The integration of IPE into medical education programs remains limited in Turkey, often restricted to elective courses [16]. At our institution, incorporating IPE into the curriculum is a strategic priority to enrich the educational experience, support institutional culture, and set an example for other faculties.

Research indicates that factors such as students'gender, professional backgrounds, prior interprofessional education (IPE) experiences, institutional differences, and cultural contexts significantly influence their participation and engagement in IPE programs. These elements shape the motivation and readiness of learners to collaborate, as differences in autonomy, competence, and relatedness are affected by diverse learning and teaching environments [8, 10, 13, 16]. For instance, female students often report higher engagement levels in collaborative learning environments, while students with prior interprofessional exposure tend to exhibit greater readiness for IPE activities [6, 10, 17]. Additionally, students'affiliation with faculties that prioritize interprofessional collaboration may further enhance their desire to participate in such programs. These factors are crucial for understanding and contextualizing participation patterns observed in this study [8, 10, 16]. Interprofessional education aims to capture students'attention, connect learning materials to context, enhance students'confidence, and reinforce the learning process by fostering a sense of satisfaction [18].

This study aims to develop and implement an IPE program utilizing the ARCS-V model to address motivational gaps and improve educational outcomes. By systematically applying ARCS-V components, the program seeks to foster intrinsic motivation, enhance collaboration skills, and ensure students' active participation in both online and face-to-face settings. The study investigates the impact of strategies that increase students'motivation on learning outcomes and provides a model for the development of IPE programs. In this context, each component of the ARCS model (Attention, Relevance, Confidence, Satisfaction) is addressed in terms of how it can be integrated into motivational design processes. This study addresses a critical gap in the literature by evaluating the application of the ARCS-V model in the development of an IPE program and its impact on motivation and learning outcomes.

Methods

The study was conducted at a university in Turkey that trained healthcare professionals between the years 2019 and 2022. Designed as an action research, the process of the present study was carried out in six stages: Deciding on the Area of Focus, Reconnaissance, Planning, Acting, Evaluation, and Monitoring (Fig. 1). Both qualitative and quantitative data were collected in the study. The ARCS-V (Attention, Relevance, Confidence, Satisfaction, and Volition) Motivation Model, and ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instructional design models were used in the development of the education program.

During the reconnaissance stage of the action research, to determine the needs, the students were asked the question"If IPE training was in your curriculum, would

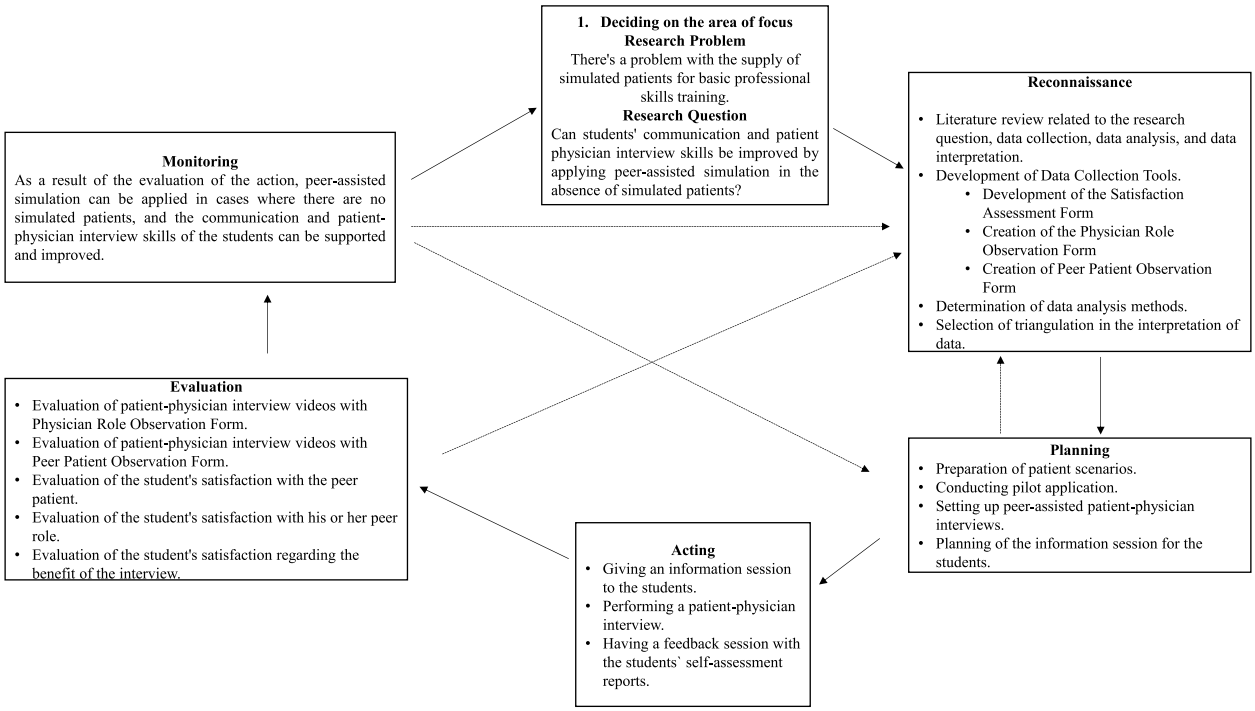

Fig. 1 Stages of action research

you like to participate?"via a digital form for a course that was not in the curriculum. 76.46% of the students responded positively to this question.

To recruit participants, students were invited to join the program through visual materials such as posters displayed in the faculties. Following this initial invitation, students who showed interest in the program were contacted via email and WhatsApp groups created specifically for communication and coordination. Informational messages were sent through these channels to ensure clarity about the program's objectives and logistics. Subsequently, a registration link was shared with these students, allowing them to voluntarily apply for participation in the training program. In the next stages of the research, after the IPE program was designed, the implementation was carried out with the participation of volunteers (25 students).

This approach ensured that while the reconnaissance stage provided insights from a broad student population (378 students), the actual implementation phase focused on a committed and manageable group of 25 volunteers. This selection was guided by the principles of motivational design models, the nature of action research, and the need for analyzing tasks effectively within a smaller group setting. A focused group allowed for detailed qualitative assessment, ensuring that the educational intervention could be thoroughly examined in terms of engagement, learning outcomes, and instructional impact. Additionally, this approach enabled the structured evaluation of group assignments and reflection tasks by educators, followed by feedback sessions, and facilitated the tracking of applied motivational strategies to assess their effectiveness. The selection criteria were clearly defined in the educational program announcement, and students who wished to participate were required to apply through the designated registration link. Only those who volunteered committed to attending all sessions without exception, and agreed to the recording and sharing of their video and audio materials for feedback sessions were invited to participate.

Deciding on the Area of Focus

Deciding on the area of focus is the stage of identifying the problem to be focused on within the research and deciding on research questions [19]. At this stage, the target participants—students from faculties of medicine, dentistry, and health sciences who are training to become healthcare professionals—were identified to provide context for the research problem. The research problem was identified as the lack of effective interprofessional collaboration among healthcare professionals, which is a key factor compromising patient safety. There is currently a significant gap in education programs that specifically foster collaboration between healthcare professionals across different fields. This lack of collaboration results in decreased quality of care, an increase in medical errors,

and compromised patient safety. The aim of our study was to design and implement an interprofessional education (IPE) program focused on patient safety to address these educational shortcomings and to promote collaboration among healthcare professionals in a way that enhances patient outcomes.

Reconnaissance

In this stage, the necessary actions to address the research problem are identified [19]. During this stage, the necessary steps to address the research problem were identified. In our research, data for the reconnaissance phase was collected from both students and faculty members. In-depth interviews with faculty members helped define the Area of Focus, while online semi-structured discussions were conducted with 22 faculty members from the faculties of medicine, dentistry, and health sciences. These discussions aimed to gather opinions on interprofessional education (IPE) and identify the key skills necessary for developing the IPE program.

To provide more depth and credibility to the program design, findings from existing literature on interprofessional collaboration were integrated into the analysis. Studies have consistently shown that effective interprofessional collaboration leads to improved patient outcomes, enhanced communication between healthcare teams, and reduced medical errors. This evidence supports the rationale for designing an IPE program that focuses on fostering teamwork and collaboration among healthcare students [20–28]. Based on this literature and the analysis of faculty discussions, the theme selected for the IPE program was "Chronic Disease Management and Patient Safety," which addresses a priority health issue in our country. The target participants, healthcare students from medicine, dentistry, and health sciences, were selected based on their future roles in providing services in this critical area.

The students' desire to participate in such training was also determined at this stage. This data was collected from the medical, dental, and health sciences faculties students through a digital form. The form collected information on students'socio-demographic characteristics and their willingness to participate in IPE, using a dichotomous (yes–no) response format.

Planning

In this stage, the educational program that will enable the solution of the research problem which was focused on is systematically planned. The instructional design is planned in accordance with the skills title "Chronic Disease Management and Patient Safety" identified at the reconnaissance stage. The ADDIE model was used for instructional design. The ADDIE model provides a systematic process for identifying instructional needs, designing and developing instructional programs and materials, implementing the program, and evaluating instructional effectiveness [29]. The objective of this course developed with the ADDIE model is to develop and implement an interprofessional training program that will enable health professional students to learn by increasing their motivation through the theme of "Chronic Disease Management And Patient Safety". This instructional experience is intended to be enriched by the motivation model. Keller suggested ARCS-V Motivation Model was used as a supportive tool in this stage. The ARCS-V motivation strategies were determined, and instructional materials were developed accordingly [30, 31]. The instructional design model using ADDIE and the ARCS-V motivation model were integrated to create the interprofessional education program, which is presented in Table 1.

Acting

The IPE program titled Chronic Disease Management and Patient Safety was carried out as a hybrid (online and face-to-face) and three-session program with a focus on interprofessional competency. The program provided students with interprofessional collaboration, communication, roles and responsibilities, ethics, lifelong learning, and health service delivery, all tailored to patient needs and teamwork.

For this program, an announcement was made through the faculties which provide healthcare education and volunteering students from the Faculties of Dentistry, Health Sciences (Nutrition and Dietetics, Nursing, Physical Therapy and Rehabilitation) and Medicine were included in the education program. A WhatsApp group of volunteer students was created and used for communication and motivational strategies. The link was sent to the students ahead of time via e-mail and the WhatsApp group. The tactics and strategies required by the ARCS-V Motivation Model were used throughout the whole process (Table 2).

- First session: In this session, which was online and lasted for 120 minutes, the education program was introduced to the students and conceptual information was presented. At the end of the online session, links to the sociodemographic data forms and RIPLS were shared with the students. At the end of the online session, links to the sociodemographic data forms and RIPLS were shared with the students.

Table 1 ADDIE instructional and ARCS-V motivational design model steps

ADDIE Instructional Design Model Steps	ARCS-V Motivational Design Model Steps	Actions
ANALYSIS (Information Collection)	Conducting motivation analysis of the students Determination of motivation goals and success criteria	In this section, the data we need for the development of the educational program was collected based on the reconnaissance stage of the action research The target group was analyzed to determine their pre-course IPE willingness and motivations The number of students and faculty members, as well as their contact information (phone number or email), were identified The socio-demographic data of the students (SD data form: Age, gender, faculty, department, and IPE willingness) were analyzed Semi-structured in-depth interviews were conducted with faculty members to obtain program information such as faculty members'awareness, students'needs, description of the current teaching–learning process in the faculties, objectives, and requirements The relevant literature was reviewed
DESIGN (Creating the main lines of the education program)	Identifying motivational strategies and tactics	Decisions were made regarding the education title, purpose, competency areas, learning objectives, duration, and strategies Assessment and evaluation methods were decided in line with the learning objectives Program evaluation methods were identified Potential strategies and tactics in line with the ARCS-V motivation model was identified Note:"ARCS-V"refers to the Attention, Relevance, Confidence, and Satisfaction components of the ARCS-V model, which is a motivation model used in instructional design
DEVELOPMENT (Implementing the design)	Creation, development, and provision of instructional materials for the education program Preparation of motivation tools (posters, presentations, videos, guides, messages, emails, etc.)	The Microsoft Teams program was selected as the tool to be used for online instruction and recording video sessions Scenarios were written and the implementation was planned Instructional strategies and the learning environment (hybrid) were developed to align with the identified skill areas The presentation materials, student guidelines, videos, posters, and IPE motivation strategies were developed and prepared Student and instructor guides were developed The education program designed with the IPE approach was reviewed
IMPLEMENTATION	**ARCS-V:** Implementation of strategies and tactics in the program	Online implementation of the conceptual framework session for students Face-to-face implementation of the developed IPE program using ARCS-V strategies and tactics
EVALUATION (Evaluation of educational objectives and learning goals achieved through the activities)	Use of assignments, tasks, and scales to measure students'progress and increase their motivation, and awarding certificates	RIPLS (pre-post) administered to students ARCS-V Scale (post) administered to students Individual reflection homework and group tasks given during the implementation IPE student success evaluation form filled out by faculty members to assess students

Table 2 ARCS-V motivational tactics and strategies

	At the beginning of the implementation	In the middle of the implementation	At the end of the implementation	Throughout the implementation
Attention	1 WhatsApp Setup 2. Welcome message, 3. Receiving expectations (Padlet) 4. What to do in the program, 5. Graphics, animation video, striking examples posters, warm-up games	6.Survey 7. Create question platforms 8. Use humor 8. Online and face-to-face program instant questioning		9. Use of e-mail 10. Messaging
Relevance	11. The importance of the program and its relation to expectations 12. Making connections with past learning	13. Importance of the topic, its use in daily life ("What if it were you?" discussion) 14. Use real case scenarios	15. Reflection assignment	16. Associating the sessions with experiences at the end of WhatsApp messages, emails, summary of the program according to the subject content
Confidence	17. Course structure 18. Achievement status, Content, Scoring 19. Explaining all the details in a manual or guide, online PowerPoint presentation	20. Introducing the whole process of completing the program (how to obtain certificates)	21. Receiving and giving feedback after the program, linking feedback with expectations	22. Assigned task, homework (process-based skills assessment)
Satisfaction		23. Receiving feedback after the face-to-face session	24. Feedback as intrinsic and extrinsic reinforcement	25. Preparing PPT from the pictures taken in the program and sharing them in the cloud program 26. Certificate
Volition	27. Invitation to access the online platform	28. Invitation to participate in programs	29. Individual message to students who could not attend the program 30. Thank you messages within the program to students who have done their duties	31. Reminder about tasks and programs 32. Event participation invitations

The second and third sessions were face-to-face and were comprised of two 8-h work days. Facilitators and students participated in these sessions.

- Second session:

  ➢ Introductions and warm-up exercises were carried out.
  ➢ In the development phase of the ADDIE instructional design, four scenarios addressing"Chronic Disease Management and Patient Safety"which involved different health professionals were prepared. The participants were randomly divided into four study small groups. Gender, age, class and health profession group appropriate to the scenario were determined as criteria in the creation of small groups. For example, the makeup of one scenario group included 2 medical students, 2 nursing students, 1 physiotherapy student, and 2 dentistry students. In a parallel manner, a different scenario group was arranged with 2 students from medicine, 2 from nursing, 1 from dentistry, and 2 focusing on nutrition and dietetics. Additionally, gender balance and equal representation from each academic class were ensured in all groups. This was based on findings from the needs assessment phase, which identified these factors as significant variables influencing participant characteristics. This strategic grouping fostered a diverse yet balanced professional composition in each group, directly aligning with the scenario-driven learning objectives.
  ➢ Two facilitators and one observer were appointed to each group. The task of the facilitators was to ensure that the scenario was read by the students and the discussion was guided by discussion questions.
  ➢ Observers watched the students and facilitators and took notes on the process of conducting the guided discussion as part of the interprofessional education program.

➢ The whole discussion process was audio- and video-recorded with the voluntary consent of the students and facilitators.
➢ At the end of the day;

- Each group was asked to make a presentation of their achievements according to the interprofessional education competencies (roles and responsibilities, communication skills, collaborative leadership, teamwork, ethics, approach to patient needs and lifelong learning) in the scenarios they discussed.
  - Each student was scored by the facilitators using the IPE student success evaluation form (IPE-SSEF).
  - Each student was given questions prepared for reflection based on the scenario they discussed and asked to submit them to the facilitators as homework within a few hours.
- In preparation for the next day, all facilitators were provided with the discussion session recordings and students'reflection assignments and were asked to prepare feedback.

- Third Session: This session was planned in a large group format including students, facilitators, and observers.

➢ The session started with a warm-up chat.
➢ A presentation on the outcomes of the discussion was made by the student who had the role of spokesperson in each group.
➢ The facilitators showed the discussion video segments to the whole group and gave feedback by sharing the positive ideas and the ideas that needed to be improved. They presented the content analysis of the student reflection assignments.
➢ At the end of the session, verbal feedback was received from all participants regarding the implementation. Certificates were given to all participants.
➢ The ARCS-V motivation model scales and the RIPLS were administered to the students.

Evaluation

In the evaluation phase of the action research, data were collected for program evaluation and assessment of student achievement. Different tools were used to evaluate the impact of the implemented course on student motivation and learning, which are the objectives.

- The RIPLS and ARCS-V Motivation Design Assessment scales were used to evaluate the effectiveness of the IPE program.

➢ Readiness for Interprofessional Learning Scale (RIPLS)

The Readiness for Interprofessional Learning Scale (RIPLS) was developed by Parsell and Bligh (1999), revised by McFadyen et al. (2005,2009) and adapted to Turkish by Ergönül et al. The RIPLS assesses perceptions of healthcare students'knowledge, skills, and attitudes regarding readiness to learn with other healthcare professionals. This scale is a three-dimensional, five-point Likert scale consisting of 19 items to measure participants'attitudes towards teamwork and collaboration, professional identity, and roles and responsibilities. According to the literature, a score of 4 and above indicates high readiness [32–34].
➢ The ARCS-V Motivation Model Scales

It is recommended to use the ARCS-V motivation model together with an instructional design model [30, 31, 35, 36]. The ARCS-V Motivation Model aims to determine the motivation levels and motivating factors of students in the collaborative learning activities of different health professionals. Therefore, it is suitable for measuring motivation in interprofessional education activities. In the present study, the ARCS-V motivation model and the ADDIE instructional design model were used together. (Table 1) ARCS-V Motivation Design Scales were used to evaluate the effectiveness of motivational strategies in the IPE program. The scales were 5-point Likert-type scales. Higher scores indicate higher motivation for learning [11].

The ARCS-V motivation model scales used in the study were as follows.

I. Instructional Materials Motivation Survey (IMMS), which was developed by Keller in 1993, was revised in 2009. The scale consists of 16 items. The subscales are based on the attention, relevance, confidence, and satisfaction factors in the ARCS-V motivation design model [31].
II. Course Interest Survey (CIS) is a scale developed by Keller in 1993. It consists of 16 items, and the subscales are based on the attention, relevance, confidence, and satisfaction factors in the ARCS-V design model [31].
III. Volition For Learning Scale (VFLS) is a scale developed by Keller and colleagues in 2020. Learners require not only sufficient motivation and volition

but also self-regulation skills (Hartnett, 2016; Keller, 2010, 2017). This 13-item scale is two-dimensional, consisting of action planning and action control [37].

- To evaluate student success; the IPE-SSEF was completed by facilitators according to the student's case of discussion of the script during the practice. Information about the scale and forms used in the assessment phase is given below.

  ➢ Interprofessional Education Student Success Evaluation Form

The IPE-SSEF was developed by researchers in accordance with the learning objectives of the subject covered in IPE. This form consists of 33 items and seven sub-dimensions including"roles-responsibilities, team and teamwork, interprofessional communication, lifelong learning, collaborative leadership, relationships with patients and recognizing their needs, and ethics". The items are scored dichotomously (0–1). A maximum of 33 points can be obtained from the scale. The rate of approaching the maximum score was used to determine the success of the students. The maximum score approach rate (MSR) was calculated as [(student's observed score/maximum score to be obtained from the scale) ×100] [38]. Students with a score of 60% and above were considered successful.

Monitoring

The Interprofessional Education course developed for pre-graduation showed that healthcare students could learn from each other for a determined theme.

The following activities were carried out for monitoring, which is the last stage of the action research.

The IPE course was recommended to faculty administrations to be integrated into all healthcare education programs. The IPE course was included in the university's elective course list with the approval of the university senate. At the 2022–2023 fall academic board meeting, a presentation was made to faculty members, program managers, department heads, and managers (dean and rector).

Students participating in the training received certifications.

Statistical analysis

The quantitative data of the study were analyzed using the SPSS 25.0 software package. Shapiro–Wilk test was employed to assess the normality of the data distribution [39].

For hypothesis testing, the Chi-square test, Independent samples t-test, and Wilcoxon Rank analysis were used for two-group comparisons. The Mann–Whitney U test and One-Way Analysis of Variance (ANOVA) were used for multiple comparisons. Statistical level of significance (α) was set at 0.05 [40].

As per the cycle of action research, the research data were collected and analyzed during the reconnaissance, implementation, and evaluation stages.

Ethics committee approval

Ethical approval for the study was granted by Ege BAYEK (dated 1.10.2019 and numbered 11/08–407).

This study was registered with ClinicalTrials.gov Identifier (NCT06525194).

Results

During the reconnaissance stage of the action research, a digital form was presented to students from the medical, dental, and health sciences faculties. A total of 378 students (response rate: 48%) completed the form. The mean age of the students was 19.86 ± 2.47 (min: 18, max: 51). It was found that 65.34% (n:247) of the students were female.

Among the students who completed the digital form, 34.13% (n = 129) studied at the Faculty of Medicine, 13.49% (n = 51) studied at the Faculty of Dentistry, and 52.38% (n = 198) studied at the Faculty of Health Sciences. Among these students, 76.46% (n = 289) reported that they wanted to volunteer to participate in any interprofessional education program to be implemented at the institution. The findings of the comparison of students who volunteered to participate in IPE according to gender, year of study, and faculty were presented in Table 3.

There were statistically significant differences between students who desired to participate in the IPE according to gender, year of study, and faculty (Chi-square:6.694, p= 0.01; Chi-square:7.254, p= 0.01; Chi-square:12.342, p= 0.00). Female students and first-year students showed significantly higher interest in participating in the IPE. The difference between the faculties was found to derive from the students of the Faculty of Medicine. Desire to participate in the IPE was found to be lower among medical students (Table 3).

Twenty-five of these students participated in the developed IPE program voluntarily. 10 (40%) of the students were from the Faculty of Medicine, 4 (16%) from the Faculty of Dentistry, 11 (44%) from the Faculty of Health Sciences. The RIPLS (Readiness for Interprofessional Learning Scale) was administered to the participating students before and after the IPE program. When comparing pre- and post-scale scores, statistically significant increases were observed in total scale scores and the teamwork and collaboration and professional identity

Table 3 Students'desire to participate in the IPE program

		Yes	No	Total	Chi-square	Statistical Significance (p)
		N	N	N		
Gender	**Female**	199_a	48_a	247,00	**6,694**[a]	**0,01**
	Male	90_b	41_b	131,00		
Year of Study	**First**	164_a	36_a	200,00	**7,254**[a]	**0,01**
	Second	125_b	53_b	178,00		
Faculty	**Faculty of Medicine**	85_a	44_a	129,00	**12,342**[a]	**0,00**
	Faculty of Dentistry	43_b	8_b	51,00		
	Faculty of Health Sciences	161_b	37_b	198,00		

sub-dimension scores (respectively $p = 0.00$, $p = 0.00$, $p = 0.00$,). Although the post-education role and responsibility subscale score of the RIPLS was found to be higher than the pre-education score, this difference was not statistically significant. ($Z = 1.79$; $p = 0.07$) (Table 4).

The findings pertaining to the ARCS-V scales administered to evaluate the motivation of students participating in the IPE program are presented below. The average score for the Instructional Materials Motivation Survey (IMMS) was found to be 4.70 ±0.35. The average score for the Course Interest Survey (CIS) ranged between 4.53 ±0.40. The average score for the Volition For Learning Scale (VFLS) ranged between 4.48 ±0.48. The ARCS-V scale results indicate high levels of student motivation following the developed IPE programme. The average scores for the dimensions of the IMMS, CIS, and VFLS scales are presented in Table 5.

The evaluation of student achievement was based on the completion of the reflection assignments, preparation and delivery of the group presentation, and the information obtained from the IPE-SSEF filled out by facilitators.

All students completed their reflection homework and prepared and delivered their group presentations. IPE-SSEF may not be suitable for use in another IPE course. In other words, IPE-SSEF should be appropriate for the learning objectives of each course. According to the IPE-SSEF completed by facilitators for each student, all students achieved a success rate of over 60%. The IPE-SSEF consisted of seven subscales, with"Lifetime Learning"and"Roles and Responsibilities"receiving the lowest scores. On the other hand,"Patient Relations"and"Interprofessional Communication"were the subscales with the highest success rates (Fig. 2).

Discussion

This study aimed to develop and implement an IPE program using the ARCS-V model to enhance students' motivation and achieve improved learning outcomes, focusing on a theme relevant to healthcare professional students:"Chronic Disease Management and Patient Safety."

Our study focuses on developing and implementing a sustainable program that takes motivational disparities and needs into account, considering factors such as gender, prior IPE experiences, class, and professional background. Huebner et al.'s study showed that health science students'perceptions of participation in IPE may differ by gender and grade level. More positive perceptions were found especially in female students and individuals with previous experience [6]. In Fuertes et al.'s study, women were more motivated than men to participate in group work [41]. Women tend to achieve more in cooperative learning environments [41]. Similarly, in this study, female students'participation rates in IPE were found to be significantly higher than males. These results support the idea that gender is a critical factor in the perception of IPE. Consistent with Huebner et al. (2021), gender differences were notable, with female students often displaying a greater openness to interprofessional collaboration, potentially due to stronger social and collaborative learning tendencies.

Shuyi et al.'s study emphasizes that the impact of IPE may vary depending on the diversity in student groups [42]. This study reveals that novice students showed higher interest in IPE. This finding suggests that novice students are more open-minded and more willing to engage in interprofessional learning. Haresaku et al.'s study examining the perceptions of dentistry and nursing students on IPE indicated that perceptions of IPE may vary among different professional groups [7]. In this study, it was determined that the participation rate of medical school students in IPE was lower than in other faculties. This situation shows that perceptions of interprofessional collaboration can be shaped according to professional disciplines. By assessing gender, academic level, and professional background before program implementation, we designed scenario groups with balanced representation, ensuring inclusivity and minimizing motivational disparities. Unlike prior studies that address such factors retrospectively, our proactive

Table 4 Readiness for interprofessional learning scale scores before and after the IPE

Subscale	Number of Students	Pre-IPE			Post-IPE			Wilcoxon Signed Ranks Test	Z	Statistical Significance (p)
		Mean	Median	Standard Deviation	Mean	Median	Standard Deviation			
Teamwork and Collaboration	25	4,32	4,61	0,86	4,80	5,00	0,31	0,47	– 2,88	**0,00**
Professional Identity	25	4,22	4,29	0,63	4,71	4,86	0,32	0,49	– 3,06	**0,00**
Role and Responsibility	25	3,50	3,50	0,58	3,73	3,67	0,65	0,23	– 1,79	0,07
Total Score	25	4,16	4,24	0,62	4,60	4,68	0,30	0,44	– 3,32	**0,00**

Table 5 Descriptive statistics for the ARCS-V motivation subscales

Scale	Subscale	Number of Students	Mean	Median	Standard Deviation	Min	Max
Instructional Materials Motivation Survey (IMMS)	Attention	25	4,77	5,00	0,34	4,00	5,00
	Relevance	25	4,66	4,75	0,47	3,00	5,00
	Confidence	25	4,61	4,50	0,41	3,75	5,00
	Satisfaction	25	4,76	5,00	0,40	3,50	5,00
	IMMS_Mean	**25**	**4,70**	**4,88**	**0,35**	**3,63**	**5,00**
Course Interest Survey (CIS)	Attention	25	4,36	4,50	0,45	3,25	5,00
	Relevance	25	4,78	5,00	0,40	3,25	5,00
	Confidence	25	4,34	4,50	0,59	3,00	5,00
	Satisfaction	25	4,64	5,00	0,53	3,00	5,00
	CIS_Mean	**25**	**4,53**	**4,63**	**0,40**	**3,13**	**5,00**
Volition For Learning Scale (VFLS)	Action Planning	25	4,45	4,60	0,55	3,20	5,00
	Action Control	25	4,50	4,50	0,48	3,38	5,00
	VFLS_Mean	**25**	**4,48**	**4,69**	**0,48**	**3,54**	**5,00**

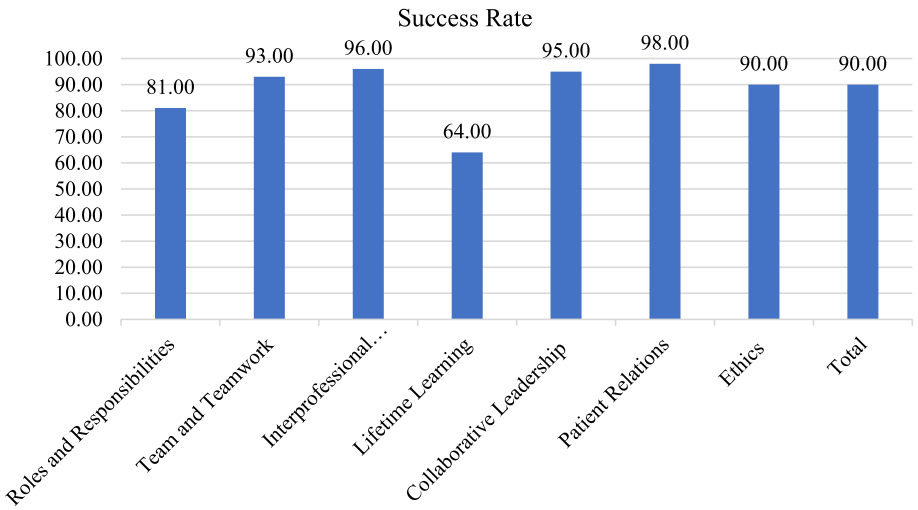

Fig. 2 Interprofessional education student success evaluation form ($N = 25$)

approach emphasizes equitable participation and a more effective learning environment.

Student success can be evaluated by measuring the competencies aligned with each scenario in the IPE program, ensuring that students acquire the intended learning outcomes. Given the evolving nature of IPE and its diverse learning objectives, a single standardized testing method may not fully capture the range of competencies developed. However, in accordance with international guidelines, each scenario can be mapped to relevant competency domains using established frameworks such as the IPEC Core Competencies [22]. By utilizing these recognized competency standards, appropriate assessment tools can be integrated to evaluate student achievement effectively. This approach allows for a structured yet flexible evaluation that aligns with globally accepted interprofessional education benchmarks. While there are studies in the literature that assess IPE satisfaction and students'readiness levels, research evaluating students' attainment of IPE learning objectives has been increasing. Studies highlight that IPE fosters collaborative skills, improves attitudes towards teamwork, and enhances professional competencies, aligning with international competency frameworks [7–9, 43]. However, despite the recognition of its importance, the availability of valid and reliable assessment tools for measuring IPE competencies remains limited. To contribute to this growing body of research, our study incorporates competency-based assessment strategies to ensure a robust evaluation of student success in achieving IPE learning objectives.

Few studies in the literature have incorporated instructional design models into IPE programs [8, 10, 13, 44, 45]. Mahler et al. reported using Kern's design model in their study; however, only the needs assessment stage was detailed, with no information on subsequent design phases [45]. Shibata (2014) used the ADDIE instructional design to develop an IPE program; however, it was designed for in-service training and did not include pre-graduation students [44]. In contrast, Teuwen et al. (2024) demonstrated the long-term benefits of using structured approaches in undergraduate IPE, emphasizing the importance of motivational frameworks and tailored group composition in enhancing outcomes [8]. Our study differs from prior research by integrating the ADDIE instructional design with the ARCS-V motivation model to create a structured, student-centred IPE program tailored to pre-graduation healthcare students. We hope that this study will contribute to the literature in terms of the use of instructional design models. This design not only addressed motivational disparities but also fostered inclusivity and engagement. Additionally, we used a wide range of tactics and strategies throughout the program to address the limitations of tailoring motivational strategies to diverse healthcare disciplines; however, comparisons with other studies remain challenging as similar tactics and strategies were not detailed in prior research.

In developing IPE programs, selecting themes that engage multiple healthcare professions is crucial. Previous studies have used diverse topics, such as sepsis [46], game-based collaboration [14], anatomy [47], and chronic disease management [28], These programs demonstrate flexibility in addressing the unique needs of different professional groups. Similarly, our program focused on"Chronic Disease Management and Patient Safety,"bringing together medical, dental, and health sciences students.

To develop an effective IPE curriculum that includes training for multiple health professions, it is essential to identify a common health issue relevant to national priorities. Selecting a shared focus area allows professionals from different disciplines to collaborate in solving real-world healthcare challenges while ensuring that their training remains contextually relevant and institutionally integrated.

The duration and structure of IPE programs can vary significantly based on institutional needs and educational goals. For example, Meche et al. implemented a three-year program with vertical integration [48], while Darlow et al. designed an 11-h program focused on interprofessional learning outcomes [28]. Our study stands out by developing an 18-h hybrid program conducted across three sessions, combining online and face-to-face modalities. This hybrid approach allowed for flexible participation while addressing diverse student needs. What sets our study apart is the integration of the ARCS-V motivation model and the ADDIE instructional design framework, creating a structured and inclusive IPE program. Unlike earlier research, our program employed ARCS-V strategies, including interactive learning scenarios, real-time feedback, and reflective exercises, ensuring sustained engagement and motivation among students. Additionally, our hybrid approach aligns with recommendations from Song who emphasized the importance of tailored motivational strategies in online learning environments[13], highlighting the need for variation in course delivery methods and interactive content. This approach not only enhanced motivation but also addressed the logistical challenges of accommodating diverse student groups, and fostering collaboration and inclusivity across healthcare disciplines.

Evaluating the effectiveness of an IPE program is as critical as its development. Readiness scales, particularly the RIPLS, are commonly used tools to measure healthcare students' readiness and perceptions of interprofessional collaboration [32–34, 49, 50]. Studies, such as those by Sytsma et al. [47] and Alruwaili et al. [51], highlight significant improvements in teamwork, collaboration, and professional identity subscales following IPE interventions. Similarly, our study demonstrated statistically significant increases in teamwork, collaboration, and professional identity subscale scores, along with an overall improvement in RIPLS scores. However, the lack of significant change in the role and responsibility subscale suggests the need for targeted strategies to enhance students'understanding of their specific roles within interprofessional teams. This aligns with previous findings that short-term IPE programs often underemphasize role clarity. One potential explanation is the limited exposure to real-world interprofessional scenarios that clearly delineate professional roles. While our program focused on collaboration and communication, incorporating more scenarios explicitly addressing role responsibilities could further enhance these competencies. Recent studies emphasize the critical role of motivation in enhancing interprofessional collaboration and learning outcomes in healthcare education. For example, Teuwen et al. demonstrated that higher autonomous motivation leads to improved long-term competence in collaborative practice. These findings underline the importance of integrating motivational frameworks like the ARCS-V model in educational program design [8]. Our study builds on this foundation by being one of the first to implement the ARCS-V model within an IPE context. Unlike Cai et al. [52], who used ARCS without the volition component, our program incorporated volition, enabling students to effectively plan and regulate their learning actions. The high scores on the Volition for Learning Scale (VFLS) in both

Action Planning and Action Control sub-dimensions confirm the model's effectiveness in supporting self-regulated learning. Additionally, the results of the Instructional Materials Motivation Survey (IMMS) reflect students'high levels of attention, relevance, confidence, and satisfaction with the learning experience. These findings align with Karabatak et al. who demonstrated that motivational strategies increase satisfaction, motivation, and academic achievement [53]. Our study reinforces the importance of designing instructional materials that engage students and sustain motivation throughout the learning process.

In our research, while each component of the methodology used (Action Research, IPE approach, ADDIE model, ARCS-V Motivation model, synchronous and face-to-face learning) is meaningful on its own, we experienced that these components could be used together effectively in this study. This experience enhanced the researchers'understanding and knowledge in the field of scientific research. Despite these gains, the successful integration of the IPE approach into educational programs is closely linked to the sense of collaboration and joint effort among educational administrators and instructors. The cultural foundations play a significant role in determining whether the IPE approach can be effectively implemented in programs. Therefore, it should not be overlooked that one of the biggest challenges in applying IPE is addressing cultural differences.

Future studies should explore various aspects of interprofessional education, including its integration into multiple health professional education programs and its impact on organizational culture and patient safety.

Limitation

The small sample size of 25 participants, due to the voluntary nature of participation and restrictions during the COVID- 19 pandemic, is a primary limitation of this study. This limited the generalizability of the findings and the potential impact of the developed IPE program.

Additionally, the IPE program and the ARCS-V motivational design model may face challenges in adaptation and scalability due to cultural and institutional factors. Differences in institutional structures, educational priorities, and cultural perceptions of interprofessional collaboration may influence the effectiveness and sustainability of such programs in diverse contexts. Future studies should consider these factors to optimize program design and implementation.

Practical implications

This study provides valuable insights for designing more effective IPE programs by integrating the ARCS-V Motivation Model and ADDIE Instructional Design Model, which can enhance student engagement and motivation. The successful use of scenario-based learning demonstrated its positive impact on collaboration, professional identity, and motivation, making it a promising approach for future IPE programs. Additionally, the findings highlight the importance of addressing role clarity within interprofessional teams, suggesting that future programs should focus on role-specific training to improve teamwork and collaboration. These implications can be applied to various healthcare educational settings, including universities and teaching hospitals, offering guidance for policymakers and curriculum developers to better prepare healthcare students for collaborative practice.

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Authors'contributions

CRediT Aysel Başer Conceptualization (equal); data curation (lead); formal analysis (lead); investigation (lead); methodology (equal); resources (equal); software (lead); visualization (equal); writing – original draft (lead); writing – review and editing (equal). Hatice Şahin Supervision (lead); validation (lead); conceptualization (equal); methodology (equal); resources (equal); visualization (equal); writing – review and editing (equal).

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Ethical approval for the study was obtained from the Ege Scientific Research and Publication Ethics Committee (BAYEK) (approval date: 1.10.2019, approval number: 11/08–407). The research was carried out in full compliance with the Declaration of Helsinki.

Consent for publication

Ethical approval for the study was obtained from the Ege Scientific Research and Publication Ethics Committee (BAYEK) (approval date: 1.10.2019, approval number: 11/08–407). The research was carried out in full compliance with the Declaration of Helsinki.

Competing interests

The authors declare no competing interests.

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